[redacted]

Vol. [redacted]

[redacted]

Aug. 15, [redacted]

[redacted]

Technical Information Service, Oak Ridge, Tenn. [redacted]

NUCLEAR SCIENCE ABSTRACTS

Nuclear Science Abstracts is issued twice monthly throughout the calendar year by the Atomic Energy Commission. It is intended primarily to serve scientists and engineers working within the Atomic Energy Project by abstracting as completely and as promptly as possible the literature of nuclear science and engineering. It covers not only the unclassified and declassified research reports of the Atomic Energy Commission and its contractors, but also material in its field of interest which appears in technical and scientific journals and unpublished research reports of government agencies, universities, and industrial research establishments.

INDEXES

Nuclear Science Abstracts is fully indexed by author, subject, and report number. Annual index issues are prepared for each volume, and the next cumulated index will appear in volume 10(1956) covering volumes 5-10. A cumulated index to volumes 1-4 was issued as volume 4, No. 24B, Dec. 30, 1950 covering authors, subjects, numbers, and report numbers. The 24th number of volumes 5 and 6 contain indexes covering the individual volumes and a completely cumulated Numerical Index of Reports.

Each issue of volume 7(1953) contains an author index to abstracts in that issue and a supplement to the Numerical Index of Reports. Subject and author indexes, as well as a cumulation of the Numerical Index of Reports, covering three-month periods are issued as supplements to the sixth, twelfth, and eighteenth issues. The 24th issue will be the annual index for the year, superseding the three index supplements mentioned above.

AVAILABILITY

Nuclear Science Abstracts is available on a subscription basis at six dollars ($6.00) a year domestic and ($8.00) foreign from

Superintendent of Documents
U. S. Government Printing Office
Washington 25, D. C.

Subscribers should send change of address notices to the above address. Nuclear Science Abstracts is also available on an exchange basis to universities, learned societies, research institutions, industrial firms, and publishers of scientific information. The Atomic Energy Commission invites correspondence from such organizations looking toward the exchange of publications. Inquiries regarding such exchanges and other official distribution as well as notices of address changes for official and exchange recipients should be sent to:

Technical Information Service
U. S. Atomic Energy Commission
P. O. Box 62
Oak Ridge, Tennessee

For information on obtaining unclassified AEC research reports see the inside back cover.

Issuing of these Abstracts does not constitute authority
for declassification of any reports.

PRINTED IN U.S.A.
PRICE 25 CENTS

The printing of this publication has been approved by the
Director of the Bureau of the Budget, August 2, 1951.

Chemistry Library

QC
770
.U56
v.7
no.7

NUCLEAR SCIENCE ABSTRACTS

Vol. 7, No. 7, April 15, 1953

TABLE OF CONTENTS

Category	Abstract	Page
REPORTS REFERENCE LIST		iii
GENERAL	1857	227
Research Programs	1857	
BIOLOGY AND MEDICINE	1858	227
Radiation Effects	1867	
Radiation Hazards and Protection	1894	
Radiation Sickness	1901	
Tracer Applications	1902	
Waste Disposal	1909	
CHEMISTRY	1911	234
Analytical Procedures	1922	
Deuterium and Deuterium Compounds	1932	
Fluorine and Fluorine Compounds	1936	
Graphite	1940	
Laboratories and Equipment	1947	
Radiation Chemistry	1949	
Radiation Effects	1950	
Rare Earths and Rare-earth Compounds	1951	
Separation Procedures	1954	
Spectroscopy	1956	
Syntheses	1957	
Tracer Applications	1959	
Transuranic Elements and Compounds	1962	
Uranium and Uranium Compounds	1964	
Waste Disposal	1965	
ENGINEERING	1967	241
Aerosols	1968	
Heat Transfer and Fluid Flow	1970	
Pumps	1975	
Vacuum Systems	1976	
MINERALOGY, METALLURGY, AND CERAMICS	1980	243
Ceramics and Refractories	1980	
Geology and Mineralogy	1982	
Metals and Metallurgy	1986	
MINERALOGY, METALLURGY, AND CERAMICS		
Tracer Applications	2008	
PHYSICS	2009	246
Aerosols	2011	
Astrophysics	2012	
Cosmic Radiation	2013	
Crystallography and Crystal Structure	2018	
Electrical Discharge	2020	
Electrons	2021	
Gases	2026	
Instruments	2028	
Isotopes	2039	
Isotope Separation	2042	
Mass Spectrography	2044	
Measuring Instruments and Techniques	2049	
Mesons	2087	
Meteorology	2097	
Microwaves	2100	
Neutrons	2101	
Nuclear Physics	2104	
Nuclear Properties	2115	
Nuclear Reactors	2137	
Nuclear Transformation	2139	
Particle Accelerators	2156	
Radiation Absorption and Scattering	2163	
Radiation Effects	2176	
Radioactivity	2182	
Shielding	2198	
Theoretical Physics	2199	
Uranium and Uranium Compounds	2215	
AUTHOR INDEX		INDEX-1
NUMERICAL INDEX OF REPORTS		INDEX-7
NEW NUCLEAR DATA		SUPPLEMENT-1
LIST OF CONTENTS OF NNES PUBLICATION		A

ERRATUM

NSA, Vol. 7, No. 4. In abstract 1112, p. 135, and in report DC-52-5-19, p. v, the words "Investigation of Constant Temperature, Forced Circulation Liquid Lithium Systems;" should be deleted from the title, "Aug." should be "Apr.", and "; B&W-5228" should appear before the final parenthesis.

REPORTS REFERENCE LIST

Vol. 7, No. 7

The abstract number for each report is listed at the upper right of the entry. If the number bears an asterisk, the report is title listed only and no abstract is included.

USAEC DECLASSIFIED REPORTS

AECD-3493 **1962**
Radiation Lab., Univ. of Calif., Berkeley
HEAT AND FREE ENERGY OF THE REACTION $AmCl_{3(s)} + H_2O_{(g)} = AmOCl_{(s)} + 2HCl_{(g)}$, by C. W. Koch and B. B. Cunningham. Nov. 10, 1952. Decl. Feb. 4, 1953. 8p. (AECD-3493; UCRL-2006)

AECD-3494 **2049**
Oak Ridge National Lab.
THE NEUTRON SENSITIVE PCP IONIZATION CHAMBER, by R. K. Abele and J. Gundlach. Issued Sept. 4, 1951. Decl. Dec. 22, 1952. 15p. (AECD-3494; ORNL-1080)

AECD-3495 **1922**
Argonne National Lab.
MANUAL OF SPECIAL MATERIALS ANALYTICAL LABORATORY PROCEDURE. Oct. 1952. Decl. with deletions, Feb. 5, 1953. 74p. (AECD-3495)

AECD-3496 **2050**
Argonne National Lab.
HIGH LEVEL γ-RAY AND NEUTRON DOSIMETRY BY GAS EVOLUTION FROM AQUEOUS SOLUTIONS, by Edwin J. Hart and Sheffield Gordon. July 15, 1952. Decl. Jan. 9, 1953. 15p. (AECD-3496; ANL-4844)

AECD-3497 **2101**
[Los Alamos Scientific Lab.]
METHODS OF TREATMENT OF DISPLACEMENT INTEGRAL EQUATIONS, by S. Frankel and E. Nelson. [nd] 94p. (AECD-3497; LADC-79)

AECD-3498 **1923**
Argonne National Lab.
ANALYSIS OF URANIUM OXIDE-POLYSTYRENE MIXTURES. Oct. 1952. Decl. Feb. 5, 1953. 4p. (AECD-3498; ANL-LFD-316; PC-1386)

AECD-3499 **1986**
Battelle Memorial Inst.
THE RECLAMATION OF ZIRCONIUM MACHINING CHIPS TO PRODUCE ARC-MELTING FEED STOCK, by R. W. Dayton, C. M. Allen, and W. U. Eberts. Oct. 24, 1952. Decl. with deletions Feb. 4, 1953. 10p. (AECD-3499; BMI-RWD-102)

AECD-3500 **2115**
Los Alamos Scientific Lab.
TOTAL NEUTRON CROSS SECTION FOR NORMAL URANIUM, by Richard L. Henkel. Jan. 14, 1953. Decl. Jan. 27, 1953. 2p. (AECD-3500; LADC-1333)

USAEC UNCLASSIFIED REPORTS

AECU-2388 **1858**
Kansas Univ. School of Medicine
CYTOLOGICAL CHANGES IN REGENERATING MOUSE LIVER, by Margaret E. Wilson, Robert E. Stowell, Hisako O. Yokoyama, and Kenneth K. Tsuboi. [nd] 24p. (AECU-2388)

AECU-2389 **1859**
Kansas Univ. School of Medicine
HISTOCHEMICAL STUDIES ON REGENERATING MOUSE LIVER, by Hisako O. Yokoyama, Kenneth K. Tsuboi, Margaret E. Wilson, and Robert E. Stowell. [nd] 35p. (AECU-2389)

AECU-2390 **1867**
Kansas Univ. School of Medicine
CYTOLOGICAL CHANGES FOLLOWING ROENTGEN IRRADIATION OF MOUSE LIVER, by Margaret E. Wilson and Robert E. Stowell. [nd] 21p. (AECU-2390)

AECU-2391 **1860**
Kansas Univ. School of Medicine
REGENERATION OF MOUSE LIVER AFTER PARTIAL HEPATECTOMY, by Hisako O. Yokoyama, Margaret E. Wilson, Kenneth K. Tsuboi, and Robert E. Stowell. [nd] 21p. (AECU-2391)

AECU-2392 **2139**
Michigan Univ.
ASSIGNMENT OF Y^{91} AND Y^{94}, by G. L. Schott and W. Wayne Meinke. [nd] 4p. (AECU-2392)

AECU-2393 **1861**
Oberlin Coll.
METABOLIC FACTORS INFLUENCING THE SODIUM AND POTASSIUM DISTRIBUTION IN ULVA LACTUCA, by George T. Scott and Hugh R. Hayward. [nd] 29p. (AECU-2393)

AECU-2394 **2116**
Argonne National Lab.
ACTIVATION CROSS-SECTIONS MEASURED WITH ANTIMONY-BERYLLIUM PHOTONEUTRONS - II, by Clyde Kimball and Bernard Hamermesh. Jan. 15, 1953. 1p. (AECU-2394; UAC-700)

AECU-2396 **2117**
Argonne National Lab.
THE THERMAL NEUTRON CAPTURE CROSS SECTION OF HYDROGEN, by B. Hamermesh, G. R. Ringo, and S. Wexler. Jan. 1953. 13p. (AECU-2396; UAC-694)

AECU-2397 1970
Argonne National Lab.
A STABLE NUMERICAL SOLUTION FOR TRANSIENT HEAT FLOW, by George Leppert. Jan. 15, 1953. 21p. (AECU-2397; UAC-706)

AECU-2399 1862
Presbyterian Hospital, Chicago
FINAL REPORT FOR PERIOD FROM 1 SEPTEMBER 1951–31 AUGUST 1952. [nd] 8p. (AECU-2399)

AECU-2400 1863
Kansas Univ.
SELECTIVE PLACENTAL TRANSMISSION OF RADIOACTIVE ALKALINE EARTHS AND PLUTONIUM, by Paul N. Wilkinson and Frank E. Hoecker. [nd] 33p. (AECU-2400)

AECU-2402 1902
Presbyterian Hospital, Chicago
EFFECT OF DIETARY CHOLESTEROL ON THE IN VITRO SYNTHESIS OF CHOLESTEROL IN DOG TISSUES, by R. Gordon Gould, C. Bruce Taylor, JoAnne S. Hagerman, Irving Warner, and Donald J. Campbell. [nd] 24p. (AECU-2402)

AECU-2403 1903
Presbyterian Hospital, Chicago
LIVER AS THE SOURCE OF PLASMA CHOLESTEROL IN DOGS, by C. Bruce Taylor, Carl B. Davis, Jr., Donald J. Campbell, Frank B. Kelly, Jr., and R. Gordon Gould. [nd] 19p. (AECU-2403)

AECU-2405 1947
Argonne National Lab.
A REMOTELY CONTROLLED PIPETTING APPARATUS FOR RADIOISOTOPES, by Walter E. Kisieleski and Donald F. Uecker. Jan. 1953. 7p. (AECU-2405; UAC-696)

AECU-2406 2051
Argonne National Lab.
NEUTRON FLUX MEASUREMENTS WITH THERMOPILES, by Alwyn C. Lapsley. Jan. 1953. 7p. (AECU-2406; UAC-698)

AECU-2407 1954
Argonne National Lab.
PAPER CHROMATOGRAPHY OF CHLOROPLAST PIGMENTS: SORPTION AT A LIQUID-LIQUID INTERFACE, by Harold H. Strain. Jan. 1953. 17p. (AECU-2407; UAC-707)

AECU-2408 2182
Argonne National Lab.
THE DECAY OF Rh^{104m} (4.3 MIN.) AND Rh^{104} (44 SEC.), by W. C. Jordan, J. M. Cork, and S. B. Burson. Jan. 13, 1953. 11p. (AECU-2408; UAC-704)

AECU-2409 1956
Argonne National Lab.
REFLECTION SPECTRA OF SOME SOLID COBALT (II) SALTS IN THE VISIBLE REGION, by Leonard I. Katzin and Elizabeth Gebert. Dec. 19, 1952. 14p. (AECU-2409; UAC-693)

AECU-2410 1911
Argonne National Lab.
A NEW MODEL FOR THE DEBYE EQUATIONS, by J. Ross MacDonald. Jan. 5, 1953. 10p. (AECU-2410; UAC-692)

AECU-2411 1904
Kansas Agricultural Experiment Station
STUDIES WITH RADIOACTIVE PYRETHRINS. I. TISSUE DISTRIBUTION, EXCRETION OF $C^{14}O_2$, AND DEGRADATION OF RADIOACTIVE PYRETHRINS ADMINISTERED TO THE AMERICAN COCKROACH, PERIPLANETA AMERICANA (L.), by Mahmoud M. I. Zeid, Paul A. Dahm, Richard E. Hein, and Robert H. McFarland. [nd] 43p. (AECU-2411)

AECU-2412 1912
Research Foundation, Okla. Agricultural and Mechanical Coll.
EXTRACTION STUDIES OF THE EXTENT OF HYDRATION OF SALTS IN NON-AQUEOUS SOLVENTS, by Paul C. Yates, Roy Laran, Robert E. Williams, and Thomas E. Moore. [nd] 13p. (AECU-2412)

AECU-2413 1913
Wisconsin Univ.
FRIEDEL CRAFTS REACTIONS BETWEEN GASEOUS BENZENE AND ETHYL CHLORIDE ON SOLID ALUMINUM CHLORIDE, by Monte Blau and John E. Willard. [nd] 12p. (AECU-2413)

AECU-2414 1905
Biophysical Lab., Harvard Medical School
STUDIES ON Ca^{45} TRANSPORT IN CRAYFISH NERVE, by Sidney Soloway, J. H. Welsh, and A. K. Solomon. Biophysical Lab., Harvard Medical School and Biological Labs., Harvard Univ. [nd] 21p. (AECU-2414)

AECU-2415 1959
Kedzie Chemical Lab., Mich. State Coll.
POSSIBLE ORIGINS OF THE METHOXYL CARBON OF LIGNIN FORMED BY HORDEUM VULGARE, by John H. Flokstra, Richard U. Byerrum, Lovell J. Dewey, and Charles D. Ball. [nd] 24p. (AECU-2415)

AECU-2417 1864
Cancer Research Inst., New England Deaconess Hospital, Boston
EFFECTS OF HYPOPHYSECTOMY, DEMEDULLATION AND EPINEPHRINE INJECTION ON THE ASCORBIC ACID CONTENT AND IN VITRO OXYGEN CONSUMPTION OF RATS' ADRENALS, by J. Sumner Wood, Jr. and Ralph W. McKee. Cancer Research Inst., New England Deaconess Hospital, Boston and Harvard Medical School. [nd] 8p. (AECU-2417)

ANL-4901 2183
Argonne National Lab.
ON THE ONE-BODY MODEL OF ALPHA RADIOACTIVITY. IIa. S-STATE DECAY WITH THE CONSISTENT SQUARE WELL MODEL, by G. H. Winslow and O. C. Simpson. Dec. 3, 1952. 30p. (ANL-4901)

ANL-4915 1971
Argonne National Lab.
TWO-PHASE PRESSURE DROP AND BURNOUT USING WATER FLOWING IN ROUND AND RECTANGULAR CHANNELS, by W. H. Jens and P. A. Lottes. Oct. 1, 1952. 44p. (ANL-4915)

ANL-4940 1924
Argonne National Lab.
THE APPLICATION OF DIFFERENTIAL COLORIMETRY TO THE THIOCYANATE-ACETONE ANALYSIS FOR URANIUM, by C. E. Crouthamel and H. M. Hubbard. Dec. 1952. 11p. (ANL-4940)

ANL-4941 1936
Argonne National Lab.
THE REFRACTIVE INDICES OF BROMINE TRIFLUORIDE—BROMINE PENTAFLUORIDE MIXTURES, by Lawrence Stein and Richard C. Vogel. Dec. 1952. 13p. (ANL-4941)

ANL-4944 2052
Argonne National Lab.
INSTRUMENT RESEARCH AND DEVELOPMENT DIVISION

QUARTERLY REPORT [FOR] SEPTEMBER, OCTOBER, AND NOVEMBER, 1952. Dec. 1952. 28p. (ANL-4944)

BMI-797 **1988**
Battelle Memorial Inst.
CREEP OF 4S-O, J51S, AND NUMBER 22 BRAZING-SHEET ALUMINUM ALLOYS AT 300 F, by H. A. Saller, J. A. VanEcho, G. R. Remely, and J. T. Stacy. Jan. 9, 1953. 26p. (BMI-797)

BNL-196 **1857**
Brookhaven National Lab.
ANNUAL REPORT; JULY 1, 1952. [nd] 148p. (BNL-196)

BNL-216 **2118**
Brookhaven National Lab.
HALF-LIFE OF 54-MIN In^{116}, by K. W. Downes, G. A. Price, R. Sher, and V. J. Walsh. Jan. 1953. 4p. (BNL-216)

BNL-1336 **1972**
Brookhaven National Lab.
ACTIVATION ENERGY FOR VISCOUS FLOW AND SHORT RANGE ORDER, by G. J. Dienes. [nd] 16p. (BNL-1336)

BNL-1338 **2119**
Brookhaven National Lab.
CORE ISOMERISM – REMARKS ON Mo^{93m}, by M. Goldhaber. [nd] 2p. (BNL-1338)

BNL-1340 **1989**
Brookhaven National Lab.
EFFECTS OF NUCLEAR RADIATIONS ON THE MECHANICAL PROPERTIES OF SOLIDS, by G. J. Dienes. [nd] 35p. (BNL-1340)

BNL-1341 **2198**
Brookhaven National Lab.
FACILITIES FOR GAMMA RADIATION RESEARCH, by Bernard Manowitz. [Jan. 1953] 12p. (BNL-1341)

BNL-1345 **1965**
Brookhaven National Lab.
ULTIMATE DISPOSAL OF RADIOACTIVE WASTES, by L. P. Hatch. Jan. 1953. 20p. (BNL-1345)

BNL-1352 **2176**
Brookhaven National Lab.
THE RADICAL YIELD RATIO OF IONIZING RADIATION IN FERROUS SULFATE AND CERIC SULFATE SOLUTIONS, by Everett R. Johnson. [nd] 12p. (BNL-1352)

BNL-1353 **2120**
Brookhaven National Lab.
COMPARISON OF THE VALUES OF THE DISINTEGRATION CONSTANT OF Be^7 IN Be, BeO, AND BeF_2, by J. J. Kraushaar, Elizabeth D. Wilson, and Kenneth T. Bainbridge. [nd] 18p. (BNL-1353)

BNL-1354 **2121**
Brookhaven National Lab.
THE PARAMETERS FOR THE SLOW NEUTRON RESONANCE IN RHODIUM, by V. L. Sailor. [nd] 17p. (BNL-1354)

COO-117 **1990**
Metallurgical Labs., Dow Chemical Co.
FINAL REPORT [FOR] DECEMBER 1, 1949 – NOVEMBER 30, 1952, [ON] PREPARATION OF HIGH PURITY MAGNESIUM AND A STUDY OF THE EFFECT OF NON-METALLIC AND ALKALI METAL IMPURITIES ON THE CORROSION CHARACTERISTICS OF PURE MAGNESIUM. [nd] 24p. (COO-117)

ISC-303 **2097**
Institute for Atomic Research, Iowa State Coll.
A METHOD FOR THE DETERMINATION OF THE COMPOSITIONS AND TEMPERATURES OF STRATOSPHERIC CLOUDS, by Matthew Parasol. Institute for Atomic Research, Iowa State Coll. and Ames Lab. Dec. 1952. 2p. (ISC-303)

KAPL-830 **2029**
Knolls Atomic Power Lab.
AN APPARATUS FOR THE STUDY OF THE EFFECTS OF CYCLIC THERMAL STRESSES ON DUCTILE METALS, by L. F. Coffin, Jr., and R. P. Wesley. Oct. 27, 1952. 47p. (KAPL-830)

LA-1494 **1869**
Los Alamos Scientific Lab.
THE INCIDENCE OF ABNORMAL LYMPHOCYTES IN THE PERIPHERAL BLOOD OF RABBITS DURING AND AFTER CHROMIC X RADIATION, by F. C. V. Worman and R. E. Carter. Nov. 1952. 16p. (LA-1494)

LA-1502 **1870**
Los Alamos Scientific Lab.
ADDITIVITY OF THERMAL NEUTRONS AND X RAYS IN THEIR ACUTE LETHAL ACTION ON MICE, by John B. Storer and Payne S. Harris. Nov. 1952. 13p. (LA-1502)

NAA-SR-199 **1991**
North American Aviation, Inc.
REDUCTION IN SIZE OF IRIDIUM AND IRIDIUM-RHODIUM ALLOY WIRES BY ELECTROLYSIS, by C. T. Young. Issued Dec. 8, 1952. 12p. (NAA-SR-199)

NYO-3708 **2122**
Rochester Univ.
ON THE CHARGE INDEPENDENCE OF NUCLEAR FORCES, by David Feldman. Jan. 13, 1953. 6p. (NYO-3708)

NYO-3713 **2087**
Rochester Univ.
CHARGE-EXCHANGE SCATTERING OF 40 MEV π MESONS IN HYDROGEN AND DEUTERIUM, by A. Roberts and J. Tinlot. Feb. 3, 1953. 37p. (NYO-3713)

NYO-3732 **2177**
Massachusetts Inst. of Tech.
X-RAY STUDY OF RADIATION DAMAGE, by B. E. Warren. Dec. 31, 1952. 8p. (NYO-3732)

NYO-3736 **1974**
Columbia Univ. School of Engineering
[PROGRESS REPORT ON] HYDRODYNAMIC ASPECTS OF LOW VISCOSITY FLUIDS [FOR] JUNE 1, 1952 TO AUGUST 31, 1952, by C. F. Kayan, G. F. Boeker, D. D. Fuller, R. T. Corry, and R. Eisenstadt. Issued Sept. 3, 1952. 72p. (NYO-3736)

NYO-3759 **1940**
Alfred Univ.
TECHNICAL PROGRESS REPORT [ON] GRAPHITIZATION OF CARBON, by V. D. Frechette and Yung Tao. Dec. 31, 1952. 4p. (NYO-3759)

NYO-4506 **1966**
New York Univ.
PROGRESS REPORT FROM JULY 1, 1951 – AUGUST 30, 1952, [ON] TREATMENT OF SYNTHETIC LAUNDRY WASTE ON TRICKLING FILTERS, by William E. Dobbins, Gail P. Edwards, and Richard Ehrenreich. Nov. 1952. 12p. (NYO-4506)

ORNL-1415 **2009**
Oak Ridge National Lab.
PHYSICS DIVISION QUARTERLY PROGRESS REPORT FOR

PERIOD ENDING SEPTEMBER 20, 1952. Issued Feb. 12, 1953. 32p. (ORNL-1415)

ORNL-1470 **2030**
Oak Ridge National Lab.
PRECISION SINGLE-CHANNEL ANALYZER; MODEL NO. 5-Q-1192, by J. E. Francis and P. R. Bell. Issued Feb. 10, 1953. 13p. (ORNL-1470)

SO-1008 **2011**
Illinois Univ. Engineering Experiment Station
TECHNICAL REPORT NO. 7 [ON] HOMOPOLAR ELECTRIFICATION OF AEROSOLS, by H. F. Kraemer and W. E. Ranz. Sept. 30, 1952. 54p. (SO-1008; Tech. Report No. 7)

TID-5103 **2010**
Technical Information Service, AEC
OUTLINE OF DECLASSIFIED VOLUMES IN THE NATIONAL NUCLEAR ENERGY SERIES. Jan. 1953. 86p. (TID-5103)

UCLA-240 **1865**
Atomic Energy Project, Univ. of Calif., Los Angeles
A STUDY OF FAT ABSORPTION USING METHYL β-ELEOSTEARATE, by Dorthy L. Fillerup, Leslie R. Bennett, Raymond D. Goodman, and James F. Mead. Issued Jan. 26, 1953. 20p. (UCLA-240)

UCLA-241 **1872**
Atomic Energy Project, Univ. of Calif., Los Angeles
THE EFFECTS OF X-IRRADIATION ON THE CIRCULATING BLOOD CELLS OF THE TADPOLE OF RANA CATESBIANA, by Ole Arne Schjeide, Mary Jane Millard, and Bennet M. Allen. Issued Jan. 30, 1953. 19p. (UCLA-241)

UCRL-1942 **2184**
Ohio State Univ.
NUCLEAR THERMODYNAMICS OF THE HEAVIEST ELEMENTS, by Glenn T. Seaborg. Ohio State Univ. and Radiation Lab., Univ. of Calif., Berkeley. Mar. 1952. 16p. (UCRL-1942)

UCRL-2027 **1957**
Radiation Lab., Univ. of Calif., Berkeley
INCORPORATION OF ADENINE INTO NUCLEOTIDES AND NUCLEIC ACIDS OF C57 MICE, by Edward L. Bennett. Dec. 1952. 26p. (UCRL-2027)

UCRL-2033 **1967**
Radiation Lab., Univ. of Calif., Berkeley
INSTRUCTION MANUAL FOR DC PORTABLE VAPOR DETECTOR MODEL 3EPS, by C. S. Presenz. Nov. 20, 1952. 23p. (UCRL-2033)

UCRL-2047 **1906**
Radiation Lab., Univ. of Calif., Berkeley
THE EFFECT OF CERTAIN BIOLOGICALLY ACTIVE SUBSTANCES UPON PROTOSYNTHESIS AND DARK CO_2 FIXATION, by E. Havinga, V. Lynch, L. Norris, and M. Calvin. Dec. 16, 1952. 25p. (UCRL-2047)

UCRL-2052 **2156**
Radiation Lab., Univ. of Calif., Berkeley
THE RADIOFREQUENCY FINE STRUCTURE OF THE PHOTON BEAM FROM THE BERKELEY SYNCHROTRON, by Richard Madey, Kenneth C. Bandtel, and Wilson J. Frank. Dec. 17, 1952. 16p. (UCRL-2052)

UCRL-2064 **2088**
Radiation Lab., Univ. of Calif., Berkeley
SUMMARY OF RESEARCH PROGRESS MEETING OF NOVEMBER 13, 1952, by Sergey Shewchuck. Dec. 23, 1952. 6p. (UCRL-2064)

OTHER UNCLASSIFIED REPORTS OF SPECIAL INTEREST TO AEC LABORATORIES

AERE-C/R-988 **2008**
Atomic Energy Research Establishment, Harwell, Berks (England)
A NEW EXPERIMENTAL FACTOR LIMITING THE QUANTITATIVE APPLICATION OF EMANATING POWER MEASUREMENTS TO THE STUDY OF DIFFUSION PROBLEMS, by D. J. M. Bevan. July 16, 1952. 19p. (AERE-C/R-988)

AERE-E/R-1024 **1914**
Atomic Energy Research Establishment, Harwell, Berks (England)
SUTTON COURTENAY WATER SUPPLY: PURIFICATION OF THE SUPPLY BY LIME SOFTENING, by G. J. C. Nash, S. S. Hill, and I. D. Aitken. Sept. 1952. 20p. (AERE-E/R-1024)

AERE-G/R-1039 **2028**
Atomic Energy Research Establishment, Harwell, Berks (England)
A FAST COINCIDENCE CIRCUIT FOR EXPERIMENTS WITH HIGH ENERGY PARTICLES, by J. M. Dickson, D. C. Salter, O. Gunnill, P. Dolley, and J. M. Cassels. Oct. 14, 1952. 8p. (AERE-G/R-1039)

AERE-M/R-964 **2018**
Atomic Energy Research Establishment, Harwell, Berks (England)
TWIN ACCOMMODATION IN ZINC, by P. L. Pratt and S. F. Pugh. May 7, 1952. 15p. (AERE-M/R-964)

AERE-M/R-1031 **1987**
Atomic Energy Research Establishment, Harwell, Berks (England)
SOME OBSERVATIONS ON THE CLEAVAGE FACE OF ZINC CRYSTALS, by P. L. Pratt and S. F. Pugh. Oct. 17, 1952. 15p. (AERE-M/R-1031)

AMRL-104 **1868**
Army Medical Research Lab., Fort Knox
RADIATION EFFECTS ON CERTAIN CONSTITUENTS OF THE LIVER AND KIDNEY IN THE RAT, by Jack R. Denson, Elizabeth J. Gray, John L. Gray, Frank J. Herbert, John T. Tew, and H. Jensen. Nov. 20, 1952. 14p. (AMRL-104)

DC-51-7-15 **1975**
Babcock and Wilcox Co.
PERFORMANCE AND THEORY OF A NEW DESIGN OF HIGH-TEMPERATURE ELECTRO-MAGNETIC PUMP; TECHNICAL REPORT NO. II, by H. G. Elrod and R. R. Fouse. July 13, 1951. 53p. (DC-51-7-15; B&W-5219; Tech. Report No. 2)

GS-C-244 **1982**
Geological Survey
RECONNAISSANCE FOR RADIOACTIVE DEPOSITS IN THE VICINITY OF TELLER AND CAPE NOME, SEWARD PENINSULA, ALASKA, 1946-47, by M. G. White, W. S. West, and J. J. Matzko. 1953. 10p., 2 illus. (GS-C-244)

NBS-1409 **2053**
National Bureau of Standards
FINAL REPORT ON THE RAYDOS DOSIMETER, by Margarete Ehrlich. Jan. 20, 1952. 8p. (NBS-1409)

NBS-2124 **2054**
Radiation Physics Lab., National Bureau of Standards
CALIBRATION OF LANDSVERK 0.2-R MIDGET FINGER CHAMBER AND LANDSVERK 0.2-R POCKET CHAMBER, by T. P. Loftus. Dec. 22, 1952. 10p. (NBS-2124)

NBS-2216 2055
Radiation Physics Lab., National Bureau of Standards
QUARTERLY PROGRESS REPORT ON RADIOLOGICAL INSTRUMENT CALIBRATION FOR THE QUARTER ENDING DECEMBER 31, 1952, by Frank H. Day. [nd] 29p. (NBS-2216)

NBS-2225 2056
Radiation Physics Lab., National Bureau of Standards
REST OF PREPRODUCTION MODELS OF BECKMAN, KELEKET, AND VICTOREEN, IM-9()/PD QUARTZ-FIBER DOSIMETERS, by T. P. Loftus and R. A. Elmendorf. Jan. 1953. 15p. (NBS-2225)

NBS-2239 2057
[Radiation Physics Lab.,] National Bureau of Standards
IONIZATION CHAMBER RESPONSE AS A FUNCTION OF WALL MATERIAL; SECOND QUARTERLY PROGRESS REPORT COVERING THE PERIOD FROM 1 OCTOBER 1952 TO 31 DECEMBER 1952, by Frank H. Attix. [nd] 24p. (NBS-2239)

NM-006-012.04.57 2058
Naval Medical Research Inst., Bethesda
A DIRECT READING RATE METER FOR HIGH INTENSITY PENETRATING RADIATION, by J. E. Morgan, F. W. Chambers, Jr., D. T. O'Connor, and J. T. Istock. Naval Medical Research Inst., Bethesda and Naval Ordnance Lab. Oct. 27, 1952. 18p. (NM-006-012.04.57)

NM-006-012.05.09 1871
Naval Medical Research Inst., Bethesda
PHARMACOLOGICAL STUDIES ON IRRADIATED ANIMALS. III. EFFECT OF SALINE ON RADIATION-INDUCED MORTALITY AND WEIGHT CHANGES, by Friedrich Ellinger. Nov. 17, 1952. 8p. (NM-006-012.05.09)

NP-4209 2026
California Inst. of Tech.
THERMODYNAMIC FUNCTIONS OF POLYELECTRONIC ATOMS AT VERY HIGH TEMPERATURES (thesis); TECHNICAL REPORT NO. 7, by Robert Vartan Meghreblian. Nov. 1952. 78p. (NP-4209; Technical Report No. 7)

NP-4248 1915
University of Southern Calif.
STUDIES ON BORON HYDRIDES: SIXTH ANNUAL TECHNICAL REPORT OF INVESTIGATIONS ON WATER-REACTIVE CHEMICAL COMPOUNDS [FOR] NOVEMBER 1, 1951 THROUGH OCTOBER 31, 1952, by Anton B. Burg. Nov. 1, 1952. 36p. (NP-4248; U-25427)

NP-4249 1916
Chicago Univ.
HYDRIDES AND BORONHYDRIDES OF LIGHT WEIGHT ELEMENTS AND RELATED COMPOUNDS: TECHNICAL REPORT FOR THE PERIOD AUGUST 1, 1951 TO JULY 31, 1952, by H. I. Schlesinger and Riley Schaeffer. Aug. 1, 1952. 30p. (NP-4249)

NP-4261 2059
Norman Bridge Lab. of Physics, Calif. Inst. of Tech.
A FINAL REPORT TO THE RESEARCH CORPORATION OF RESEARCH AND DEVELOPMENT [ON] AN AXIAL FOCUSING MAGNETIC BETA-RAY SPECTROMETER OF HIGH LUMINOSITY, RESOLVING POWER AND PRECISION, WITH PROTON-RESONANCE-STABILIZED HOMOGENEOUS FIELD (WITHOUT IRON); COMPRISING THE THEORY, DESIGN, CONSTRUCTION, AND TESTS OF THE NEW INSTRUMENT, by Jesse W. M. DuMond, Louis Bogart, James L. Kohl, David E. Muller, and James R. Wilts. Mar. 1952. 98p. (NP-4261; Special Technical Report No. 16)

NP-4302 1992
Institute of Engineering Research, Univ. of Calif., Berkeley
THE EFFECT OF DISPERSIONS ON THE CREEP PROPERTIES OF ALUMINUM-COPPER ALLOYS; TWENTY SECOND TECHNICAL REPORT, by Warren H. Giedt, Oleg D. Sherby, and John E. Dorn. Dec. 1, 1952. 23p. (NP-4302; U-23892)

NP-4313 1993
New York Univ.
FINAL REPORT [ON] THE QUENCH HARDENING OF TITANIUM-MANGANESE ALLOYS, by Y. C. Liu and H. Margolin. Sept. 15, 1952. 24p. (NP-4313; WAL-401/88-17; U-25922)

NP-4337 1917
Chemical Lab., Univ. of Kan.
TECHNICAL REPORT NO. 2 [ON] THE PREPARATION OF A SOLID RHENIDE, by Justo B. Bravo, Ernest Griswold, and Jacob Kleinberg. [nd] 19p. (NP-4337; Technical Report No. 2; U-25984)

NP-4338 1918
Texas Univ.
THE ELECTROCHEMICAL POLARIZATION OF ZIRCONIUM IN NaCl SOLUTIONS, by Norman Hackerman and Olin B. Cecil. Dec. 1, 1952. 42p. (NP-4338; U-26127)

NP-4342 1994
Cryogenic Lab., Ohio State Univ.
TECHNICAL REPORT NO. 102-AC49/2-100-2 [ON] THERMAL, STRUCTURAL, ELECTRICAL, MAGNETIC AND OTHER PHYSICAL PROPERTIES OF TITANIUM, ZIRCONIUM, HAFNIUM AND THORIUM AND SOME OF THEIR SIMPLE COMPOUNDS. II. ZIRCONIUM, ITS HYDRIDES, OXIDES, HALIDES, NITRIDE, CARBIDE, AND THE ALKALINE EARTH ZIRCONATES, by G. B. Skinner, C. W. Beckett, and H. L. Johnston. Feb. 1, 1950. 74p. (NP-4342; ATI-81815; Tech. Report No. 102-AC49/2-100-2)

NP-4345 1973
Applied Science Research Lab., Univ. of Cincinnati
PROGRESS REPORT NO. 5 [ON] A STUDY OF POROUS MEDIA BY MEANS OF FLOW METHODS [FOR] JULY 1, 1952 to SEPTEMBER 30, 1952, by John Ross and Gerard Kraus. Oct. 9, 1952. 11p. (NP-4345; Progress Report No. 5)

NP-4361 1995
Bureau of Mines, College Park, Md.
INTERIM TECHNICAL REPORT ON EFFECT OF ATMOSPHERIC CONTAMINANTS ON ARC WELDS IN TITANIUM [FOR] JULY 1 TO DECEMBER 31, 1952, by J. C. Barrett, I. R. Lane, Jr., and R. W. Huber. [nd] 38p. (NP-4361; WAL 401/155-1)

NP-4362 1983
National Research Council, Div. of Geology and Geography
REPORT OF THE COMMITTEE ON THE MEASUREMENT OF GEOLOGIC TIME [FOR] 1951-1952. 1953. 157p. (NP-4362)

NP-4367 1996
Battelle Memorial Inst.
THE EFFECT OF HYDROGEN ON THE MECHANICAL PROPERTIES OF TITANIUM, by G. A. Lenning, C. M. Craighead, and R. I. Jaffee. July 31, 1952. 64p. (NP-4367)

NP-4373 1997
Metallurgical Advisory Committee on Titanium
STATUS BULLETIN ON UNCLASSIFIED TITANIUM RESEARCH AND DEVELOPMENT OF ARMY ORDNANCE CORPS. Stanley Abkowitz, ed. Nov. 1952. 63p. (NP-4373; Status Bull. P7)

NP-4380 2199
Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro (Brazil)
NON RELATIVISTIC EQUATION FOR CHARGED PARTICLES WITH SPIN $^3/_2$, by J. Tiomno. Dec. 25, 1952. 10p. (NP-4380; Physics Note No. 9)

NP-4382 2060
Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro (Brazil)
ON THE PHOTOSENSITIVITY OF GLASS SELF-QUENCHING GEIGER-MÜLLER COUNTERS WITH EXTERNAL CATHODE, by Helmut Schwarz. Dec. 1952. 9p. (NP-4382; Physics Note No. 7)

NP-4383 1925
Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro (Brazil)
ON THE EMPLOYMENT OF LIQUID EMULSION IN THE TITRATION OF URANIUM FROM RADIOACTIVE MINERALS, by F. A. G. A. Brandão, Elisa Frota-Pessôa, Neusa Margem, and Waldir Perez. Nov. 1952. 11p. (NP-4383; Physics Note No. 6)

NP-4384 1984
Department of Mines and Technical Surveys (Canada)
ELECTRONIC CONCENTRATION OF ORES WITH THE LAPOINTE PICKER BELT, by C. M. Lapointe and R. D. Wilmot. 1952. 44p. (NP-4384; Memo No. 123)

NRL-4083 2019
Naval Research Lab.
LATTICE DYNAMICS OF BODY-CENTERED AND FACE-CENTERED CUBIC METALLIC ELEMENTS, by Jules de Launay. Jan. 13, 1953. 30p. (NRL-4083)

USNRDL-377 2061
Naval Radiological Defense Lab.
A PHOTOGRAPHIC METHOD FOR MEASURING THE DISTRIBUTION OF DOSAGE FROM RADIUM NEEDLES AND PLAQUES, by E. Tochilin. Oct. 1, 1952. 19p. (USNRDL-377)

USNRDL-378 1873
Naval Radiological Defense Lab.
POST-IRRADIATION PROTECTION ACTIVITY ASSOCIATED WITH SPLEEN SUBCELLULAR COMPONENTS, by L. J. Cole, M. C. Fishler, and V. P. Bond. Dec. 15, 1952. 28p. (USNRDL-378)

NUCLEAR SCIENCE ABSTRACTS

Vol. 7 March 15, 1953 No. 7

GENERAL

RESEARCH PROGRAMS

1857

Brookhaven National Lab.

ANNUAL REPORT; JULY 1, 1952. [nd] 148p. (BNL-196)

This annual report of Brookhaven National Laboratory describes the programs and activities for the fiscal year 1952. The progress and trends of the research programs are presented with a description and summary of the operational, service, and administrative activities. The scientific and technical details of the various projects are treated in this report primarily in summary form, whereas the activities of the service organizations are treated more fully. See BNL-131 for the 1951 report. (auth)

BIOLOGY AND MEDICINE

1858

Kansas Univ. School of Medicine

CYTOLOGICAL CHANGES IN REGENERATING MOUSE LIVER, by Margaret E. Wilson, Robert E. Stowell, Hisako O. Yokoyama, and Kenneth K. Tsuboi. [nd] 24p. (AECU-2388)

Cytological studies of the liver of the mouse following partial hepatectomy are reported which suggest that the recovery period should be divided into two phases. First there is a stage of rapid restoration of liver cells, essentially complete by the seventh day. Then there follows a period of about a month in which occur varying amounts of secondary regenerative activity, in many instances associated with focal necrosis. There is an impressively successful recovery in almost all instances. Apparently the focal necrosis delays but does not prevent this final recovery. Mitotic activity during regeneration is described. (auth)

1859

Kansas Univ. School of Medicine

HISTOCHEMICAL STUDIES ON REGENERATING MOUSE LIVER, by Hisako O. Yokoyama, Kenneth K. Tsuboi, Margaret E. Wilson, and Robert E. Stowell. [nd] 35p. (AECU-2389)

A study is reported of the histochemical localization of lipids, glycogen, nucleic acids, and enzymes in normal and regenerating mouse liver. An attempt was made to correlate various changes with physiological processes related to premitotic enlargement of cells, mitotic activity, and subsequent reorganization of parenchymal cells. (C.R.)

1860

Kansas Univ. School of Medicine

REGENERATION OF MOUSE LIVER AFTER PARTIAL HEPATECTOMY, by Hisako O. Yokoyama, Margaret E. Wilson, Kenneth K. Tsuboi, and Robert E. Stowell. [nd] 21p. (AECU-2391)

Extirpation of 65% of the mouse liver results in rapid growth of the remaining lobe so that the original mass is essentially restored by the 6th day in terms of percentage of liver to body weight. However, the original total liver weight, nitrogen, and desoxyribose nucleic acid are not completely recovered until the 8th day. The total number of nuclei increases more slowly and reaches 87% of the normal value at 28 days after hepatectomy. Parenchymal nuclei comprise only 56% of the total nuclei of normal mouse liver, the remainder belonging to bile duct, Kupffer, connective tissue, smooth muscle, and mesothelial cells and also to macrophages and leukocytes. These non-parenchymal elements are increased between the 3rd and 45th days of regeneration. Substantial individual variation is observed in the response of mice to partial hepatectomy. The time interval after operation is not a satisfactory, uniform criterion of the degree of restoration of the liver remnant in individual mice. 23 references. (auth)

1861

Oberlin Coll.

METABOLIC FACTORS INFLUENCING THE SODIUM AND POTASSIUM DISTRIBUTION IN ULVA LACTUCA, by George T. Scott and Hugh R. Hayward. [nd] 29p. (AECU-2393)

Methods for the use of the marine green alga, Ulva lactuca, in studies on electrolyte metabolism are described. The effects of illumination and iodoacetate on the cellular K and Na content, as well as the influences of light and running sea water on the iodoacetate effect were investigated. The rate of exchange of cellular K ion for K^{42} under conditions of light and dark at 20 and 30°C was also studied. Ulva maintained in the dark for long periods loses some K and gains Na, both effects being reversed upon illumination. The presence of 0.001M iodoacetate in the dark causes a marked progressive loss of K and gain of Na by the cell, phenomena which do not occur when the alga is illuminated. Evidence for the penetration of the inhibitor into the cell in the presence of light is presented. The iodoacetate effect on K and Na content, once established, can be "washed out" of the cell when placed in light and running sea water without the inhibitor. Illumination and increased temperature each favor a more rapid exchange of cellular for environmental K ion. (auth)

1862

Presbyterian Hospital, Chicago

FINAL REPORT FOR PERIOD FROM 1 SEPTEMBER 1951–31 AUGUST 1952. [nd] 8p. (AECU-2399)

An hypothesis for the mechanism of regulation of plasma cholesterol concentration has been evolved, suggesting that an increase in plasma cholesterol level from any cause will rapidly result in an increase in liver cholesterol concentration which will depress the rate of hepatic cholesterol synthesis, and conversely a decrease in plasma level will cause an increase in the rate of synthesis in liver, thus tending to preserve the constancy of the plasma cholesterol level. Doses of ~2 mg of labeled cholesterol per kg body weight were fed to humans, dogs, rabbits, and rats to determine the rate of appearance and disappearance in blood. In all species the time for cholesterol to reach maximum specific activity varied from 1 to 1.5 days in dogs to 22 days in the other species, as compared with 3 to 6 hr for fat and less for other nutrients. Average fibrinogen turnover time in 5 humans was 7.8 days. Studies on dogs indicate that plasma cholesterol molecules appear in all body tissues studied

except the central nervous system. Average cholesterol synthesis rate for 27 control rabbits was 0.32 mg/100 g of liver per hr, 0.0038 for 16 determinations on 6 cholesterol-fed rabbits, and 0.18 for 18 determinations on 6 fat-fed rabbits. Time of maximum specific activity for liver cholesterol and rate of equilibration between liver and blood was considerably slower for rabbits than dogs. Equilibration of thoracic duct lymph cholosterol with that of blood in dogs was found to be rapid. Doses of sitosterol in humans did not noticeably affect the rate of appearance of cholesterol in blood. (L.T.W.)

1863

Kansas Univ.

SELECTIVE PLACENTAL TRANSMISSION OF RADIOACTIVE ALKALINE EARTHS AND PLUTONIUM, by Paul N. Wilkinson and Frank E. Hoecker. [nd] 33p. (AECU-2400)

A series of experiments are described in which the placental transmission of several of the alkaline earth metals and Pu is investigated, and results are presented which demonstrate the existence of significant differences in the physiological activity of those elements. It was found that the arrangement of these compounds in order of the magnitude of transmission is $Ca^{45} > Ba^{140} > Pu^{239} > Ra^{226}$. A discussion of the possible significance of these results and the results obtained by other workers is presented. It was concluded that the placental transmission of the compound investigated is dependent upon the molecular weight of the cation and that analogies between the known properties of one member of the group and those of another member should be made with extreme caution. It was conjectured that the results were indicative of a fundamental difference in metabolic handling of these substances by the animal organism and that similar differences might exist in the mechanism of deposition of these elements in mammalian bone. (auth)

1864

Cancer Research Inst., New England Deaconess Hospital, Boston

EFFECTS OF HYPOPHYSECTOMY, DEMEDULLATION AND EPINEPHRINE INJECTION ON THE ASCORBIC ACID CONTENT AND IN VITRO OXYGEN CONSUMPTION OF RATS' ADRENALS, by J. Sumner Wood, Jr. and Ralph W. McKee. Cancer Research Inst., New England Deaconess Hospital, Boston and Harvard Medical School. [nd] 8p. (AECU-2417)

The complex relations between pituitary and adrenal glands have been studied from the standpoint of changes in the ascorbic acid content and O consumption of the adrenals in rats, following hypophysectomy, adrenal demedullation, demedullation plus hypophysectomy, and epinephrine injections. Although the O consumption of adrenals from hypophysectomized rats was markedly elevated, the values obtained for the glands from demedullated-hypophysectomized and from demedullated animals were normal. The adrenal ascorbic acid was considerably lower in the hypophysectomized than in the control rats. To a lesser extent, the adrenal ascorbic acid was lower than normal in the demedullated and demedullated-hypophysectomized animals. With a single administration of epinephrine there was a marked decrease in the ascorbic acid content of the adrenals and a definite rise in the O consumption of the glands. However, with multiple injections of freshly diluted epinephrine, only a very small drop in adrenal ascorbic acid was noted, and there was no detectable alteration in O consumption. The explanation for these phenomena is not apparent. (G.Y.)

1865

Atomic Energy Project, Univ. of Calif., Los Angeles

A STUDY OF FAT ABSORPTION USING METHYL β-ELEOSTEARATE, by Dorthy L. Fillerup, Leslie R. Bennett, Raymond D. Goodman, and James F. Mead. Issued Jan. 26, 1953. 20p. (UCLA-240)

A study of fat absorption in 12 normal young adults and 2 persons with intestinal disturbances was made using methyl β-eleostearate as a tracer. Serial blood determinations indicated a wide variation between normal individuals and even in the same individual at different times. Since the blood level represents the balance between absorption and clearance, it is concluded that the serum lipid level is of limited value in measuring fat absorption per se. (auth)

1866

A GENETIC ANALYSIS OF THE ADAPTIVE VALUES OF POPULATIONS. Bruce Wallace and J. C. King. Proc. Natl. Acad. Sci. U.S. 38, 706-15(1952) Aug.

An analysis of viabilities of individuals heterozygous for chromosomes sampled from a number of experimental populations of D. melanogaster has made it possible to identify the determinants of the adaptive values of the populations. Individuals of drastically reduced viabilities are so rare in populations that they have little effect in determining the adaptive values. Of the normal individuals, those carrying lethal or semilethal chromosomes have, in some populations, lowered average viabilities (1 to 3% lower than individuals carrying "normal" chromosomes). In these same populations, however, the individuals carrying two normal second chromosomes have viabilities that account for anywhere from 29 to 99% of the reduction in adaptive values. (auth)

RADIATION EFFECTS

1867

Kansas Univ. School of Medicine

CYTOLOGICAL CHANGES FOLLOWING ROENTGEN IRRADIATION OF MOUSE LIVER, by Margaret E. Wilson and Robert E. Stowell. [nd] 21p. (AECU-2390)

The cytological changes in the livers of mice observed 1, 2, and 3 days after exposure to doses of x radiation up to 12,000 r while the rest of the body was shielded are compared with cytological changes observed in the livers of fasted normal and fasted irradiated controls. It is demonstrated that while the liver is affected by x irradiation, many of the cells are resistant as far as visible evidence of change is concerned. (C.R.)

1868

Army Medical Research Lab., Fort Knox

RADIATION EFFECTS ON CERTAIN CONSTITUENTS OF THE LIVER AND KIDNEY IN THE RAT, by Jack R. Denson, Elizabeth J. Gray, John L. Gray, Frank J. Herbert, John T. Tew, and H. Jensen. Nov. 20, 1952. 14p. (AMRL-104)

Lethal total-body x irradiation (1000 and 880 r) of rats produced the following changes in certain constituents of the liver or kidney. As early as one day after irradiation, both inorganic and labile phosphate (ATP) in the liver were definitely subnormal. The liver inorganic phosphorus remained at this low level through the 3rd day after irradiation while the labile phosphate continued to fall slowly. On the 4th day, both inorganic and labile phosphate in the liver rose. The inorganic phosphorus approached the control level where it remained until death. The labile phosphate, however, reached the control range on about the 5th day after irradiation and apparently continued to rise slowly until death. In the kidney, the changes which occurred in the phosphate distribution were not pronounced. The fasting of rats immediately following total-body x irradiation resulted in what appeared to be a retarded rate of glycogenolysis. After 24 hr fasting, following radiation, liver glycogen values were 2% as compared with 0.1% in the fasted non-irradiated group. In adrenalectomized animals the liver glycogen content was also found to be higher after irradia-

tion and fasting than the liver glycogen content found after fasting alone. The liver ATP content was found to be lowered 24 hr after irradiation. These findings indicate that liver ATP is utilized during glycogen systhesis. Glycogen formation in the liver apparently requires high energy phosphate bonds. A definite increase in the sulfhydryl content was found in the liver of fasted x-irradiated animals as compared with non-irradiated fasted animals. Removal of the adrenals produced a decrease in the sulfhydryl content of the liver of fasted animals. It was further reduced by irradiation. No significant changes were observed in the sulfhydryl content of the kidney of normal rats after irradiation. There was no significant effect of x irradiation upon the Na, K, or water content of the liver and kidney up to 48 hr after irradiation with perhaps the exception of a slight increase in the Na in the kidney. Liver cytochrome oxidase activity showed only slight variations from the time of radiation exposure to subsequent death. The possible influence of fasting on these liver and kidney constituents has been considered. (auth)

1869

Los Alamos Scientific Lab.

THE INCIDENCE OF ABNORMAL LYMPHOCYTES IN THE PERIPHERAL BLOOD OF RABBITS DURING AND AFTER CHRONIC X RADIATION, by F. C. V. Worman and R. E. Carter. Nov. 1952. 16p. (LA-1494)

Ten New Zealand white female rabbits were given a weekly dose of 3 r of 250 kvp x rays. Five rabbits were given a total dose of 30 r and five received a total of 60 r. The 10 exposed animals and 10 controls were bled three times weekly by puncture of the peripheral ear vein. Four smears were made of each animal at each bleeding. The experiment was divided into pre-exposure, exposure, and post-exposure periods. The entire experiment continued over a period of 42 weeks during which time 428,145 lymphocytes were examined. Results are shown in graphic and tabular form and a statistical analysis of the data is made. Results indicate that 12 to 15 r are required to inaugurate the production of abnormal lymphocytes under the conditions of this experiment. The incidence of abnormal forms maintained a fairly constant level during the exposure period and gradually disappeared from the peripheral blood during the post-exposure observations. (auth)

1870

Los Alamos Scientific Lab.

ADDITIVITY OF THERMAL NEUTRONS AND X RAYS IN THEIR ACUTE LETHAL ACTION ON MICE, by John B. Storer and Payne S. Harris. Nov. 1952. 13p. (LA-1502)

The additivity of dissimilar radiations from the thermal column of the Los Alamos Homogeneous Reactor and from a 250 kvp x-ray machine was tested using 30-day lethality in CF_1 mice as the end effect. Over the range of total dose and with the dose ratios used, the radiations were found to be completely additive and exhibited no synergistic or antagonistic action. It was concluded that subtracting effects of inherent γ contamination from the mixed radiation of the thermal column to determine the effectiveness of thermal neutrons is a valid practice. (auth)

1871

Naval Medical Research Inst., Bethesda

PHARMACOLOGICAL STUDIES ON IRRADIATED ANIMALS. III. EFFECT OF SALINE ON RADIATION-INDUCED MORTALITY AND WEIGHT CHANGES, by Friedrich Ellinger. Nov. 17, 1952. 8p. (NM-006-012.05.09)

In order to clarify the role of physiological NaCl injections in pharmacological studies on irradiated animals, the investigations reported in this paper have been undertaken. Daily injections of 0.3 cc of 0.9% NaCl solution into mice of 22 g ± 15% body weight subsequent to the exposure to x-ray doses representing the LD_{60}/14 days and LD_{30}/14 days for periods of 14 and 6 days, respectively, caused a delay in the development of the mortality produced by these x-ray doses. While the 14-day administration of saline did not materially change the x-ray-induced mortality rate, 6-day administration resulted in a statistically significant decrease of the mortality rate in mice exposed to the LD_{60}/14 days. The saline-induced change of x-ray mortality was also reflected in the weight curve of the animals. The results obtained in this study indicate that saline cannot be considered as an inert agent in pharmacological studies on irradiated animals under all circumstances. This has to be kept in mind if and when the effect of a certain chemical dissolved in saline is used for a study of its effect on radiation-induced mortality. (auth)

1872

Atomic Energy Project, Univ. of Calif., Los Angeles

THE EFFECTS OF X-IRRADIATION ON THE CIRCULATING BLOOD CELLS OF THE TADPOLE OF RANA CATESBIANA, by Ole Arne Schjeide, Mary Jane Millard, and Bennet M. Allen. Issued Jan. 30, 1953. 19p. (UCLA-241)

X irradiation at 100, 250, 500 and 1000 r markedly decreased the number of circulating white blood cells in the tadpole of Rana catesbiana. This decrease was slower after a dose of 100 r than in the case of 250 to 1000 r, and involved all of the peripheral cell types. It was fastest in the case of the lymphocytes and slowest in the case of the thrombocytes. No restoration of the peripheral cells was apparent during 25 days post-irradiation. Assuming that the decrease in the various types of cells was due to their different life spans rather than to direct effects of irradiation, estimates of the apparent functional life spans were made. (auth)

1873

Naval Radiological Defense Lab.

POST-IRRADIATION PROTECTION ACTIVITY ASSOCIATED WITH SPLEEN SUBCELLULAR COMPONENTS, by L. J. Cole, M. C. Fishler, and V. P. Bond. Dec. 15, 1952. 28p. (USNRDL-378)

Homogenates of spleens from normal, young LAf_1 mice were fractionated by differential centrifugation in sucrose media. The isolated subcellular fractions were injected into x-irradiated adult LAf_1 mice which had received an LD_{100} x-ray exposure (750 r). Thirty-day mortality and body weight loss were used as criteria for evaluation of radiation protection. Post-irradiation protection by mouse spleen homogenate was found to be associated with the cell nuclei fraction. The highest activity was exhibited by the nuclei isolated in a modified isosmotic sucrose-salt medium which was fortified with adenosine triphosphate. In 2 of the experiments 100% of the irradiated mice, each injected with the nuclei fraction derived from 280 mg of spleen tissue, were alive 30 days after exposure, whereas none of the irradiated controls survived. No activity was observed in the mitochondria, microsome, or soluble supernatant fractions isolated in this medium. Fractionation in isotonic sucrose solution resulted in a relative decrease in protective activity both in the whole spleen homogenate and in the nuclei fraction. The mitochondria isolated in this medium showed a low degree of radiation protection activity. Crude nucleic acid extracts prepared by treating the nuclei fraction with 1M NaCl were inactive. The data suggest that the spleen radiation protection factor is noncellular in nature. It is proposed that the factor may be a nucleoprotein. (auth)

1874

STUDIES ON THE MECHANISM OF ACTION OF IONIZING RADIATIONS. VIII. EFFECT OF HYDROGEN PEROXIDE

ON CELL METABOLISM, ENZYMES AND PROTEINS. E. S. Guzman Barron, Louise Seki, and Phyllis Johnson. Arch. Biochem. and Biophys. 41, 188-202(1952) Nov.

In acid solutions and in the presence of titanium sulfate, the amount of H_2O_2 formed on x irradiation of water was strictly proportional to the x-ray dose, so that the determination of H_2O_2 could be used to check the calibration of x-ray machines. Hydrogen peroxide formation was depressed on addition of electrolytes; on irradiation of Ringer bicarbonate the amount formed was half that found on irradiation of distilled water. Addition of protein diminished it further. This diminution is attributed to the reaction of O_2H radicals with the solute; H_2O_2 had very little effect on a number of substances of biological importance; its effect became more pronounced on addition of Fe^{++} ions which give OH radicals. Hydrogen peroxide inhibited partially the metabolism of single cells. However, the inhibition occurred only with concentrations beyond those found on irradiation of biological fluid with lethal doses of x rays. It is concluded that H_2O_2 formation has a negligible role in the mechanism of action of ionizing radiations on biological systems. (auth)

1875

STUDIES ON THE MECHANISM OF ACTION OF IONIZING RADIATIONS. IX. THE EFFECT OF X-IRRADIATION ON CYTOCHROME c. E. S. Guzman Barron and Veronica Flood. Arch. Biochem. and Biophys. 41, 203-11(1952) Nov.

Aqueous dilute solutions of ferrocytochrome c were easily oxidized by x rays, the oxidation being proportional to the intensity of irradiation. The ionic yield was 0.54. The oxidation produced by 10,000 r was completely reversed on addition of dithionate. The oxidation seems to be brought about only by OH radicals produced on x irradiation of water, because catalase offered no protection and the absence of oxygen did not reduce the extent of oxidation. X irradiation attacked also the protein and porphyrin components of cytochrome. The protein portion was more sensitive in alkaline solutions, whereas the porphyrin portion was more sensitive in acid solutions. X irradiation seems to produce an oxidation of the chromophore double-bond groups of porphyrin, which is manifested by a decrease of all the absorption bands characteristic of this substance. The ionic yield, as calculated from a decrease of the Soret band, was rather low: 0.015 in neutral solutions and 0.046 in acid solutions. (auth)

1876

STUDIES ON THE MECHANISM OF ACTION OF IONIZING RADIATIONS. X. EFFECT OF X-RAYS ON SOME PHYSICOCHEMICAL PROPERTIES OF PROTEINS. E. S. Guzman Barron and P. Finkelstein. Arch. Biochem. and Biophys. 41, 212-232(1952) Nov.

On x irradiation of aqueous solutions of serum albumin, serum globulin, and egg albumin, there was an increase in the absorption of ultraviolet light, the increase being more marked around 2400 A. The increase in optical density was proportional to the x-ray dose and inversely proportional to protein concentration. Addition of salts protected greatly the protein solutions against these changes. The increase in optical density was more marked in alkaline solutions. Irradiation of oxygenated solutions showed a greater increase in optical density around 2400 A. The absorption spectrum changes seem to be due to oxidation tyrosine residues and of other oxidizable groups. Irradiation of 0.07% aqueous solutions of serum albumin with 75,000 r at 25°C produced precipitation, which did not occur on irradiation at the temperature of ice water. Precipitation was avoided by increasing the protein concentration or by the addition of salts. The viscosity of proteins increased slightly on irradiation with 50,000 r. There were no marked changes in the electrophoretic mobilities or the sedimentation constants. On irradiation with 100,000 and 200,000 r there was appearance of a second component, which may be taken as a dimer. Addition of cysteine prevented the appearance of the dimer. However, once the dimer was formed, cysteine did not revert the protein to its original structure. (auth)

1877

EFFECTS OF RADIOPHOSPHORUS P^{32} ON THE GONADS OF VIVIPAROUS CYPRINODONTES. Jean Vivien. Compt. rend. 236, 535-8(1953) Feb. 2. (In French)

Male and female Xiphophorus helleri H. and Lebistes reticulatus H. were kept for 40 days in an aquarium to which had been added initially 200 μc of P^{32}/liter. Autopsy at the end of this time showed that the gonads in all the fish had undergone profound structural modifications, which are described in detail. (G.Y.)

1878

THE EFFECT OF OXYGEN ON THE PRODUCTION BY FAST NEUTRONS OF CHROMOSOMAL ABERRATIONS IN TRADESCANTIA MICROSPORES. Norman H. Giles, Jr., Alvin V. Beatty, and Herbert Parkes Riley. Genetics 37, 641-9(1952) Nov.

An experiment has been performed to determine the effect of O_2 on the production by fast neutrons of chromosomal aberrations in Tradescantia microspores. Inflorescences were exposed in a special airtight lucite chamber in atmospheres of either pure O_2, pure N_2, or pure He. Studies were made of both chromatid aberrations and chromosome aberrations. The results of this experiment indicate that, in the absence of O_2, the frequencies of all types of aberrations are reduced when equal dosages of fast neutrons are compared. However, a quantitative comparison of these results with previous observations on the O_2 effect with x rays and with α particles in Tradescantia and Vicia indicates that this effect with neutrons is intermediate, being greater than that found with α particles and less than that found with x rays. There is thus an inverse relationship between the specific ionization produced by a given type of radiation and the magnitude of the O_2 effect on chromosome aberration production. This relationship is interpreted in terms of differential spatial distributions, and consequent interactions, of the primary radiation products, in the presence of O_2, following the exposure of cells to various types of radiations. The relationship between fast-neutron dosage and aberration frequency is linear for all types of aberrations in both the presence and absence of O_2. This finding provides further evidence for a relative localization of radiation effects to the immediate vicinity of particle tracks within a cell whether such effects are considered to be produced indirectly or directly. (auth)

1879

THE MOLECULAR WEIGHT OF INSULIN AND THE INACTIVATION OF INSULIN BY FAST CHARGED PARTICLES. Richard Setlow and Barbara Doyle. Arch. Biochem. and Biophys. 42, 83-90(1953) Jan.

The inactivation of dry amorphous insulin by deuterons and electrons indicates that the unit of hormonal activity is roughly spherical and of molecular weight 23,000. The changes in the absorption spectrum of dry insulin after deuteron bombardment are similar to those found with ultraviolet inactivation. (auth)

1880

EFFECTS OF DAILY IRRADIATION BY FAST NEUTRONS ON MALE FERTILITY. G. J. Neary, R. J. Munson, and R. H. Mole. Nature 171, 256(1953) Feb. 7.

CBA mice were exposed daily to fast neutrons by irradiating U on the floor of the cage with thermal neutrons. A dose of 70 rep at the weekly dose rate of 8.3 rep reduced the fertility of male mice to half that of controls. An accumulated dose of 100 rep halved the average weight of the testis, and after this dose there was no recovery of fertility. In contrast, the female CBA mouse was less sensitive to the

sterilizing effects of fast neutrons. An accumulated dose of 140 rep in 17 weeks did not seem to affect the ability to conceive or produce young. The difference in sex sensitivity is opposite to that usually accepted for x and γ rays, and the low dose for absolute sterilization in males is also noteworthy. The dose rate that produced such striking testicular damage had no effect on growth rate or body weight for 35 weeks, produced no great hematological changes by the time the male mice were permanently sterile, and did not appear to produce cataracts until some time after considerable losses in weight occurred. (G.Y.)

1881

SOME OBSERVATIONS ON THE EFFECT OF GAMMA IRRADIATION ON THE BIOCHEMISTRY OF RABBIT BONE MARROW. John F. Thomson, Wallace W. Tourtellotte, Magdalene S. Carttar, and John B. Storer. Arch. Biochem. and Biophys. 42, 185-96(1953) Jan.

Exposure of one leg of rabbits to 310 or 620 r from a γ-ray source produced a marked decrease in the concentration of ribo- and desoxyribonucleic acids in the exposed marrow in comparison with the control leg. The degree to which the these changes occurred could be minimized by pretreatment of the rabbit with phenylhydrazine. Separation of the marrow into its subcellular components revealed that although the total number of nuclei was decreased by radiation, the concentration of DNA per nucleus was unaltered. Little of the decrease in RNA occurred in the nucleus; per unit nitrogen, the mitochondria, particles, and supernatant showed progressively greater diminution of RNA phosphorus. These results could be best explained on the basis of a relatively selective elimination of cell types having high concentrations of cytoplasmic RNA, with a relative increase of cell types containing small amounts of RNA remaining after irradiation. (auth)

1882

ENERGY ABSORPTION IN HUMAN TISSUE BY NUCLEAR PROCESSES WITH HIGH-ENERGY X-RAYS. R. J. Horsley, H. E. Johns, and R. N. H. Haslam. Nucleonics 11, No. 2, 28-31(1953) Feb.

The energy absorption in tissue due to nuclear reactions amounts to at most 0.6% of the energy absorbed in the conventional manner. Most of the energy absorption results from the setting in motion of heavy particles such as protons, neutrons, α particles, and nuclei. Even if this value is arbitrarily increased by a factor of 10 to allow for differences in ion density, it is unlikely that nuclear absorption is of any appreciable biological significance. The percentage change in chemical composition due to nuclear transformations is very minute and unlikely to be of biological importance. (auth)

1883

THE INDUCTION OF TRANSLOCATIONS AND RECESSIVE LETHALS IN DROSOPHILA UNDER VARIOUS OXYGEN CONCENTRATIONS. William K. Baker and Charles W. Edington. Genetics 37, 665-77(1952) Nov.

Translocations were induced in Drosophila virilis sperm by exposing to 2000 r of x rays adult males maintained in various concentrations of O_2 during treatment. Less than one-fourth as many translocations are induced in the absence of O_2 (in N_2) as is the case when the males are irradiated in 100% O_2. Studies on the production of sex-linked recessive lethals in D. melanogaster indicate that about one-half as many lethals are induced by 4000 r of x rays when the males are exposed in a N_2 environment as compared with pure O_2. For the induction of both translocations and recessive lethals, the shape of the curves relating the genetic effect to O_2 concentration is strikingly similar. At low O_2 concentrations, small changes in the O_2 tension cause a rapid rise in the amount of genetic effect produced until a concentration of about 11% is reached. At this point the curves break sharply and further increase in the amount of O_2 has little or no effect on the frequency with which translocations or recessive lethals are induced by a given dosage of x radiation. On the basis of these data, it is still an open question in Drosophila as to whether a low O_2 tension is reducing the initial number of primary events produced by the radiation or whether it is influencing the reunion of broken chromosome ends such that restitution is favored over recombination. (auth)

1884

RECOVERY IN BIOLOGY. Paul Lamarque. Presse méd. 60, 1039-41(1952) July 12. (In French)

Bombyx mori silkworm eggs were exposed to single and fractionated instantaneous doses of up to 2000 r of x rays. The effects on recovery, as measured by the per cent of hatching, of placing the eggs in an incubator or in a refrigerator during the interval between irradiations, of varying the length of the interval, and of varying the initial dose were studied. The existence of a critical radiation dose for optimum recovery is discussed. (G.Y.)

1885

PULMONARY RADIOLESIONS SUBSEQUENT TO TREATMENTS OF THORACIC LOCALIZATIONS IN HODGKIN'S DISEASE. M. Pierre-Lehman. Sang, Le, 23, 700-8(1952). (In French)

In order to sterilize completely a thoracic center of Hodgkin's disease, a total x-ray dose of 6500 to 7000 r must be applied to the mediastinum through two fields over 15 to 25 days. Radiograms of the extensive radiolesions of the lungs sometimes resulting from this treatment are presented. (G.Y.)

1886

AGENTS MODIFYING CELLULAR METABOLISM. I. ACTION OF NEUTRONS, TRYPAFLAVINE, AND VEGETABLE EXTRACTS ON MITOSES OF VEGETATIVE ROOT TIPS. Flávio Resende. Bol. soc. portuguesa ciênc. nat. (2), 182-211(1951). (In Portuguese)

In the introduction, the author analyzes the part played by radiations and cytocide substances in the treatment of cancer. He calls attention to the fact that it is not only necessary to inhibit the multiplication of cancer cells, but also to modify, in the organism affected by the cancerous state, the state of the body fluids (internal humoral environment) which is favorable to cancerous differentiation or cancerous mutation. He is of the opinion that surgical intervention or chemotherapy can eliminate all the cancer cells existing in the organism at one time, without by this means avoiding a relapse. The relapse will occur, sooner or later, as soon as there is failure to eliminate the internal medium of differentiation or mutation of normal into cancerous cells. The author tries to compare the ways by which physical and chemical agents inhibit cellular growth. The physiological and structural changes (chromosome mutations) brought about by neutron radiations, by trypaflavine, and by three different plant extracts (the extract of old external scales of Allium cepa, of Urginea maritima bulbs and of the seeds of Hyoscyamus niger) when applied to the mitosis of the root tips of Allium cepa or of Aloe mitriformis var. commelinii, are analyzed. The extracts were applied both in the aqueous solutions where the plants were placed for growth of the roots, and by injection into the bulb in the case of Allium cepa. A lengthy summary in English is included. 29 figures. (G.Y.)

1887

EFFECT OF RADIOACTIVE SUBSTANCES ON PLANT GROWTH. S. Gericke. Landwirtsch. Forsch., Suppl. 2, 72-6(1952). (In German)

Various American and German experiments on the stimu-

lation of plant growth and yield by the use of radioactive surface or fertilizer applications are summarized. 12 references. (G.Y.)

1888

INFLUENCE OF THE ALIMENTARY REGIME ON THE RADIOSENSITIVITY OF THE GUINEA PIG. Jean François Duplan. Compt. rend. 236, 424-6(1953) Jan. 26. (In French)

Guinea pigs receiving a supplement of cabbage in addition to the necessary proteins were less sensitive to the effects of a whole-body x irradiation than were those whose diet was completed with carrots. (tr-auth)

1889

IMMEDIATE EFFECT OF AN IRRADIATION WITH X RAYS ON THE THYROID FUNCTION IN THE RAT. Pierre Landau, Jeanne Leschi, and Maurice Tubiana. Compt. rend. 236, 240-2(1953) Jan. 12. (In French)

Male rats of 250 g weight were intraperitoneally injected with 15 μc of I^{131}, and immediately or at periods up to 4 days were irradiated on the thyroid region with 55-kev x rays, the skin dose of 25,000 r corresponding to ~15,000 r delivered to the thyroid gland. External γ-ray measurements indicated either an increased thyroid fixation or a decreased excretion in rats irradiated 24 hr after the I^{131} injection. The curves obtained from the rats irradiated 0 to 6 hr after the injection make the latter hypothesis more probable. Extraction after 6 hr and analysis of thyroids from the immediately irradiated rats showed a decrease in the quantity of thyroxine radioiodine (T) with respect to the nonthyroxine protein radioiodine (P−T), which seems to favor a slackening of thyroxine production. The ratio (P−T)/T was 7.5 for the irradiated rats and 5.5 for the controls. (G.Y.)

1890

THE EFFECT OF OXYGEN ON THE INDUCTION OF CHROMATID ABERRATIONS IN TRADESCANTIA MICROSPORES BY X-IRRADIATION. Herbert Parkes Riley, Norman H. Giles, Jr., and Alvin V. Beatty. Am. J. Botany 39, 592-7(1952) Oct.

An abstract of this material was indexed as report AECU-1685 and appears in Nuclear Science Abstracts as NSA 6-24.

1891

EFFECT OF SOFT ROENTGEN RAYS ON THE RABBIT SKIN. William R. Christensen, Sheldon C. Sommers, and Charles K. Spalding. Am. J. Roentgenol. Radium Therapy Nuclear Med. 68, 801-8(1952) Nov.

Unfiltered 100-kv x-ray beams produced superficial cytological effects in the skin of rabbits. At moderate dosage the effects were limited entirely to the epidermis. Single dosages of 7000 to 15,000 r produced permanent pathological effects at levels extending as far as the muscular layer of the cutis. (C.R.)

1892

SECONDARY GLAUCOMA, CATARACT AND RETINAL DEGENERATION FOLLOWING RADIATION. W. E. Fry. Trans. Am. Acad. Ophthalmol. Otol. 56, 888-9(1952) Nov.-Dec.

The case history is presented of an eye wherein extensive pathological changes occurred which are attributed directly to the effects of x radiation. (C.R.)

1893

MODIFICATION BY WHOLE-BODY X IRRADIATION OF GLYCOGEN UTILIZATION BY THE LIVER DURING FASTING. Marguerite Lourau. Compt. rend. 236, 422-4 (1953) Jan. 26. (In French)

In both mice and guinea pigs, a whole-body x irradiation modified glycogen utilization by the liver during fasting. Strong (2000 r) and average (1000 r) doses, all lethal, had immediate effects, resulting in increased glycogen. The strong doses acted by preserving the existing reserves and at the same time favoring gluconeogenesis. With average doses, only the second mechanism was maintained. Sublethal (500 r) doses had no immediate effect. (tr-auth)

RADIATION HAZARDS AND PROTECTION

1894

AN INVESTIGATION INTO THE REMOVAL OF RADIOACTIVE CONTAMINATION FROM THE HANDS. James Gregory. Brit. J. Ind. Med. 10, 32-40(1953) Jan.

A method is described for assessing the comparative value of certain washing agents in removing radioactive contamination from workers' hands. The method is based on the use of α hand-monitoring machines to detect contamination before and after a number of washes. Ten cleansing agents were compared; of these white Windsor soap and a mixture of equal parts of soap-powder and wood-flour were found to be the two most effective for cleansing the hands of contamination with substances containing U and Ra. (auth)

1895

USE OF THORIATED TUNGSTEN ELECTRODES IN INERT GAS SHIELDED ARC WELDING; INVESTIGATION OF POTENTIAL HAZARD. A. J. Breslin and W. B. Harris. Am. Ind. Hyg. Assoc. Quart. 13, 191-5(1952) Dec.

The potential hazard associated with the use of thoriated W electrodes in inert-gas arc welding was investigated. The basis on which the suspicion of a hazard rests is the presence of radioactive Th oxide (normally 1 to 2%) in the electrodes. Measurements were made to establish the concentration of activity in the vicinity of the welding operation and the rate at which radioactive material was released into the air from the arc. The data indicate that, within the limits of the test, welding may be done with no significant hazard to the operator or other room occupants, and that no special ventilation or protective equipment is needed. (L.M.T.)

1896

RESULTS OF EXAMINATIONS OF IMPAIRED HEALTH OF RADIUM AND X-RAY WORKERS. Marie Rejsková. Pracovní Lekařství 4, 200-7(1952) June 15. (In Czech)

An analysis is made of the results of 1685 examinations of 442 persons working with Ra and x rays who have been followed over a number of years by the Prague Clinic for Occupational Diseases and Work Hygiene. They included medical personnel and industrial x-ray workers. No data were available for the analysis of the amount of radiation at the work sites; in other words the absolute exposure was not known. Instead the authoress makes use of the relative exposure, i.e., the length of time worked with Ra and x rays. Skin changes are estimated separately, and their frequency is shown. She further considers the subjective symptoms of those examined and the objective changes seen in the blood count. When worked through statistically, only the neutrophils show estimable changes. It is shown that more serious changes (lasting absolute neutropenia) are significantly more frequent with medical personnel than with industrial. Of the medical personnel it is mainly doctors who are affected. The relation between changes in the absolute neutrophil count and the relative exposure, i.e., length of work with Ra and x rays is shown. As a basis for comparison with the normal population, the authoress makes use of figures given by Pachner. It is also shown that with doctors working with x and Ra rays the average neutrophil count falls below $M-1\sigma$ after 3 yr; after 10 yr of work there follows a further fall below $M-2\sigma$. This leads the authoress to the conclusion that at this period radiologists require special preventive attention. She is convinced that with improved protective measures in work with radiation, this critical period will set in at progressively later stages. (auth)

1897
PROTECTIVE EFFECT OF SUCCINONITRILE AGAINST A LETHAL WHOLE-BODY IRRADIATION IN THE RAT. L. Mazzanti and M. Franchi. Arch. ital. sci. farmacol., 261-2 (1952) July. (In Italian)

Young male rats of 75 to 90 g weight were divided into three lots. The first lot received a 500-r whole-body x irradiation without undergoing additional treatment, the second lot was injected intraperitoneally with 8 mg/g of succinonitrile before irradiation, and the third received an equal injection subcutaneously for each of 3 days before irradiation. All the control animals died within 10 days of the irradiation, the mean survival time being 148 hr. The second lot all died within 7 days with a mean survival time of 104 hr. Of the third group, 33% died within 15 days, mean survival time 289 hr, while 67% survived indefinitely in good health. (G.Y.)

1898
DECREASE IN RADIOSENSITIVITY OF THE RAT AND GUINEA PIG BY THE ANTERIOR PITUITARY GROWTH HORMONE. Antoine Lacassagne and Herbert Tuchmann-Duplessis. Compt. rend. 236, 440-3(1953) Feb. 2. (In French)

Somatotropic hormone, injected daily in almost lethal 1-mg doses for 6 days preceding or following whole-body x irradiation (150 r for guinea pigs; 250, 300, 500, or 900 r for rats) decreased the radiosensitivity of these animals. In the guinea pig, the injections exerted only a protective effect, whereas in the rat both protective and curative action was noted. The increased radioresistance therefore can not be attributed to hyperglycemia. (G.Y.)

1899
MODIFICATION OF ACUTE IRRADIATION INJURY IN MICE AND GUINEA-PIGS BY BONE MARROW INJECTIONS. Egon Lorenz, Charles Congdon, and Delta Uphoff. Radiology 58, 863-77(1952) June.

It has been shown that bone marrow injections following lethal doses of irradiation are highly effective in reducing mortality in mice and guinea-pigs. The protection obtained with heterologous bone marrow suggests a humoral (non-cellular) factor. However, the superior protection obtained with homologous bone marrow may indicate, in addition, a cellular factor. No information is available yet as to the way in which such factors hasten recovery. (auth)

1900
EFFECT OF LEUKOCYTE-PROMOTING FACTOR (LPF) ON SURVIVAL OF X-IRRADIATED MICE. J. B. Storer, P. Sanders, and C. C. Lushbaugh. Proc. Soc. Exptl. Biol. Med. 81, 541-2(1952) Nov.

Treatment of irradiated mice with leukocytosis-promoting factor (LPF) did not significantly increase their 30-day survival. This fact strongly suggests that if survival of irradiated mice into which normal spleens have been implanted is due to a humoral factor released by the spleen, such a factor is unrelated to the specific leukocyte-promoting factor obtained from sterile exudates. The present study does not contribute to the discussion as to whether or not a humoral substance is secreted by the spleen. It does show, however, that LPF, a logical therapeutic agent, is ineffective in reducing x-ray mortality in mice. (auth)

RADIATION SICKNESS

1901
ATOM BOMB RADIATION SICKNESS; REPORT FROM HIROSHIMA. Koichi Ishibashi. Merck Rept. 62, 18-20 (1953) Jan.

This study summarizes clinical observations made on 108 patients who had rather clear case records of radiation sickness from the time of the bombing of Hiroshima August 6, 1945, until early in January 1946, and an additional 62 patients who were admitted to the Kusatsu Hospital in 1946. The study deals only with patients who suffered directly or indirectly from radiation at the time of the atom bomb explosion. (auth)

TRACER APPLICATIONS

1902
Presbyterian Hospital, Chicago
EFFECT OF DIETARY CHOLESTEROL ON THE IN VITRO SYNTHESIS OF CHOLESTEROL IN DOG TISSUES, by R. Gordon Gould, C. Bruce Taylor, JoAnne S. Hagerman, Irving Warner, and Donald J. Campbell. [nd] 24p. (AECU-2402)

A method has been developed for estimation of the rate of synthesis of cholesterol and total fatty acids in tissue slices by measuring the extent of incorporation of C^{14}-acetate. Synthesis is expressed both as per cent of the amount present defined as regeneration rate and in mg per 100 g of tissues defined as rate of synthesis. Data are presented on the rate of regeneration and of synthesis of cholesterol and of total fatty acids in liver, skin, and intestinal mucosa of normal and of cholesterol-fed dogs. Liver has been found to show the fastest rate of cholesterol regeneration and synthesis of any tissue studied in control dogs, and to have a very low rate of cholesterol regeneration and synthesis in cholesterol-fed animals. Neither skin nor intestinal mucosa showed a significant decrease in the rate of cholesterol synthesis as a result of cholesterol feeding. The specificity of the influence of dietary cholesterol on hepatic cholesterol synthesis was shown by the lack of effect on the rates of fatty acid synthesis. (auth)

1903
Presbyterian Hospital, Chicago
LIVER AS THE SOURCE OF PLASMA CHOLESTEROL IN DOGS, by C. Bruce Taylor, Carl B. Davis, Jr., Donald J. Campbell, Frank B. Kelly, Jr., and R. Gordon Gould. [nd] 19p. (AECU-2403)

Studies are reported on the effect of hepatectomy on the rate of appearance of isotopic cholesterol in the blood of dogs, as measured with intravenously administered C^{14}-acetate, and on the rate of appearance of the isotope in respiratory CO_2, and in cholesterol and fatty acids in a number of tissues of control and hepatectomized dogs. Labeled cholesterol molecules appeared in the plasma more rapidly than would be expected on the basis of the known turnover rate for plasma cholesterol of about 8 days. The specific activity values for plasma cholesterol were more than half as high as those of liver within 4 hr. Data suggest that under normal circumstances the liver is the site of origin and the regulator of plasma cholesterol, but that cholesterol synthesized in intestinal mucosa may appear in plasma by following the same pathway as dietary cholesterol. (auth)

1904
Kansas Agricultural Experiment Station
STUDIES WITH RADIOACTIVE PYRETHRINS. I. TISSUE DISTRIBUTION, EXCRETION OF $C^{14}O_2$, AND DEGRADATION OF RADIOACTIVE PYRETHRINS ADMINISTERED TO THE AMERICAN COCKROACH, PERIPLANETA AMERICANA (L.), by Mahmoud M. I. Zeid, Paul A. Dahm, Richard E. Hein, and Robert H. McFarland. [nd] 43p. (AECU-2411)

The tissue distribution and metabolism of C^{14}-labeled pyrethrins and cinerins in the American cockroach, Periplaneta americana (L.), have been studied. The internal distribution of the C^{14}-labeled insecticides and their metabolites have been determined in male and female cockroaches approximately 4 hr following mesothoracic, interspiracular administration of lethal doses of the insecticides. Of the following dissected tissues: fore-, mid-, and hind-intestine,

brain, thoracic ganglia, thoracic muscle, and abdominal fat, the fore-intestine contained the greatest amount of radioactivity. From ⅔ (in males) to ¾ (in females) of the radioactivity administered to the insects was retained in the remainder of the insect's body, implying a rather extensive distribution of the insecticides or their metabolites. (auth)

1905

Biophysical Lab., Harvard Medical School

STUDIES ON Ca^{45} TRANSPORT IN CRAYFISH NERVE, by Sidney Soloway, J. H. Welsh, and A. K. Solomon. Biophysical Lab., Harvard Medical School and Biological Labs., Harvard Univ. [nd] 21p. (AECU-2414)

The change in Ca^{45} content with time at 15°C of a crayfish chela nerve previously incubated in van Harreveld's solution is given by: $R = b\,(4.0\,e^{-0.0883t} + e^{-0.0048t})$, where R = Ca^{45} content at time t, and b is an arbitrary constant. Lowering the Ca concentration in the bathing medium to 4 millimoles/liter does not affect the Ca^{45} loss. The temperature coefficient (for a 10° rise to 25°C) of the process is very small or negative. (auth)

1906

Radiation Lab., Univ. of Calif., Berkeley

THE EFFECT OF CERTAIN BIOLOGICALLY ACTIVE SUBSTANCES UPON PHOTOSYNTHESIS AND DARK CO_2 FIXATION, by E. Havinga, V. Lynch, L. Norris, and M. Calvin. Dec. 16, 1952. 25p. (UCRL-2047)

Preliminary studies are reported of the influence of dinitrophenol, chloromycetin, penicillin, pyrithiamine, and aureomycin on CO_2 fixation by Scenedesmus obliquus in the dark and the light as studied by C^{14} tracer techniques and chromatographic analysis of the various radioactive substances formed during photosynthesis. Metabolic effects, and modifications of these effects by the addition of various chemicals, are discussed. (C.R.)

1907

SCINTIGRAMS OF THE THYROID GLAND. THE DIAGNOSIS OF MORPHOLOGIC ABNORMALITIES WITH I^{131}. Franz K. Bauer, William E. Goodwin, Thomas F. Barrett, Raymond L. Libby, and Benedict Cassen. Calif. Med. 77, 380-2(1952) Dec.

Functioning thyroid tissue containing sufficient radioiodine can be visualized by scanning the gland with a directional scintillation counter. This visual representation of the gland is called a scintigram. Scintigrams have been invaluable in the detection and study of both toxic and nonfunctioning nodules, diffuse enlargement of hyperthyroidism and the subsequent reduction in gland size after treatment, carcinoma, and aberrant thyroid tissue. Indications for a scintigram and clinical applications are discussed. (C.R.)

1908

ON THE METABOLIC EQUIVALENCE OF DEUTERIUM AND TRITIUM IN ANIMAL EXPERIMENTATION. Roy C. Thompson and John E. Ballou. Arch. Biochem. and Biophys. 42, 219-20(1953) Jan.

Preliminary results reported from studies of the comparative metabolic behavior of deuterium-labeled and tritium-labeled compounds injected into rats showed no significant differences in retention, although small isotopic effects were suggested in certain tissues. (C.R.)

WASTE DISPOSAL

1909

BURNING RADIOACTIVE WASTES IN INSTITUTIONAL INCINERATORS. Alfred Machis and John C. Geyer. Am. Ind. Hyg. Assoc. Quart. 13, 199-205(1952) Dec.

Results are reported of a study of the use of the usual type of institutional incinerator without gas filters or dust control for the disposal of waste containing P^{32}. It was found that the major part of the P^{32} in incinerated wastes may be expected to remain in the ashes where it may cause a dust hazard. (C.R.)

1910

A RAPID METHOD FOR THE EXTRACTION OF RADIOIODIDE FROM URINE. D. G. Arnott and J. Wells-Cole. Nature 171, 269-70(1953) Feb. 7.

Removal of radioiodine by passing the urine through a tube packed with grated fused AgCl was found to be a practical improvement over the method of Purves (Nature 169, 111 (1952)). The AgCl preparation is very stable and is regenerated on decontaminating the column. Neither boiling nor filtration of the urine is necessary. (G.Y.)

CHEMISTRY

1911

Argonne National Lab.

A NEW MODEL FOR THE DEBYE EQUATIONS, by J. Ross MacDonald. Jan. 5, 1953. 10p. (AECU-2410; UAC-692)

A new model for the Debye dispersion equations is presented which consists of a solid or liquid material containing free charge carriers. At least one electrode must be blocking for the charge carriers. The conditions under which space-charge polarization capacity and conductance depend on frequency according to Debye equations are discussed, and the dependence of the limiting values of these quantities on the mobility and concentration of the charge carriers is considered. The relaxation time is proportional to the separation of the electrodes, to the inverse of the mobility, and to the square root of the inverse of the concentration. Finally, the theory is employed to interpret qualitatively some data recently appearing in the literature on the high-frequency dispersion of Se rectifiers and on dispersion in photoconductors. (auth)

1912

Research Foundation, Okla. Agricultural and Mechanical Coll.

EXTRACTION STUDIES OF THE EXTENT OF HYDRATION OF SALTS IN NON-AQUEOUS SOLVENTS, by Paul C. Yates, Roy Laran, Robert E. Williams, and Thomas E. Moore. [nd] 13p. (AECU-2412)

The extent of hydration of some divalent metal chlorides and perchlorates was determined by a modification of the procedure of Katzin and Sullivan (J. Phys. Colloid Chem. 55, 346(1951)), and an attempt was made to correct for the extraction of nonhydrate water. This correction is sometimes as much as 99% of the total water extracted and is never less than 5%. When salt extraction is negligible, plots of concentration of water extracted against the water activity of the aqueous salt solutions for different salts lie on a common curve. Plots of salt concentration in nonaqueous phase (moles/1000 g octanol-2) are shown for $Co(ClO_4)_2$, $Ni(ClO_4)_2$, LiCl, $ZnCl_2$, and $CaCl_2$. All salts showed satisfactory linear relationships between salt extracted and hydrate water, whereas a plot against total water gives a meaningless negative slope for $CaCl_2$ and an S-shaped curve for LiCl from which any arbitrary slope between 0 and 1 could be assigned. Corrected curves are shown, and slopes obtained from the corrected curves are given. (L.T.W.)

1913

Wisconsin Univ.

FRIEDEL CRAFTS REACTIONS BETWEEN GASEOUS BENZENE AND ETHYL CHLORIDE ON SOLID ALUMINUM CHLORIDE, by Monte Blau and John E. Willard. [nd] 12p. (AECU-2413)

It has been shown that gaseous ethyl chloride and benzene

at a few centimeters pressure and 0 to 25°C react rapidly to form ethyl benzenes when in contact with solid $AlCl_3$. The rate is proportional to the pressure of each reactant, and the over-all activation energy is about 4 kcal/mole. Infrared analysis, radioactive carbon analysis, and titration of HCl have been used to follow the reaction. The products include ethyl benzene, the three diethyl benzenes, and more complex compounds. (auth)

1914

Atomic Energy Research Establishment, Harwell, Berks (England)

SUTTON COURTENAY WATER SUPPLY: PURIFICATION OF THE SUPPLY BY LIME SOFTENING, by G. J. C. Nash, S. S. Hill, and I. D. Aitken. Sept. 1952. 20p. (AERE-E/R-1024)

Treatment of water with calcium hydroxide was investigated in the laboratory, in a model precipitator at the water works (river water), and in the plant (tap water). Results and conclusions are given. An estimate of chemical requirements and costs are included. (J.E.D.)

1915

University of Southern Calif.

STUDIES ON BORON HYDRIDES: SIXTH ANNUAL TECHNICAL REPORT OF INVESTIGATIONS ON WATER-REACTIVE CHEMICAL COMPOUNDS [FOR] NOVEMBER 1, 1951 THROUGH OCTOBER 31, 1952, by Anton B. Burg. Nov. 1, 1952. 36p. (NP-4248; U-25427)

B_4H_{10} reacted with excess Me_3N at –78°C according to the equation $B_4H_{10} + (3 + x)\ Me_3N \rightarrow 3\ Me_3NBH_3 + BH{\cdot}xMe_3N$. A nonvolatile BH-polymeric material was obtained with an amount of EtOH insufficient for complete solvolysis. The action of CO on B_5H_{11} yielded a carbonyl, apparently B_5H_7CO, which was slightly more volatile than the pentaboranes. The carbonyl decomposed to CO, a colorless oil, and small amounts of B_2H_6, BH_3CO, and B_4H_{10}; it reacted with BH_3CO to give a 60% yield of B_4H_{10}. The compounds $C_5H_{10}NH{\cdot}BH_3$, $C_5H_{10}NBH_2$, and $C_5H_{10}NB_2H_5$ were prepared from piperidine and B_2H_6 by a method similar to the procedure for synthesizing $Me_2NB_2H_5$. Pure $(Me_2N)_2BF$ was made from Me_3N and Me_2NBF_2 and converted to pure Me_2NBF_2 by adding BF_3. Decomposition rates were studied for the reaction $Me_2NBMe_2{\cdot}BF_3 \rightarrow Me_2BF + Me_2NBF_2$ at 0 to 16°C; the first part of the reaction conformed to the Prout-Tompkins acceleratory law. Heating converted the dimethylphosphinoborine polymers to the trimers in contrast to the tendency of MePH- and H_2P-borines to form high polymers. Properties of $MePH_2{\cdot}BH_3$, $Me_2PH{\cdot}HBMe_2$, and $Me_2PH{\cdot}BMe_3$ are reported. The trimer of Me_2PBMe_2 was nearly as stable and chemically inert as that of Me_2PBH_2. Heating PH_3 with B_2H_6 at 65°C yielded a nonvolatile product having the empirical formula $Pb_{1.15}H_{3.91}$, presumably a cross-linked phosphinoborine, which was chemically inert and insoluble. A product designated H_2PBMe_2 was obtained largely as a monomer; in ether solution, it gradually formed a high polymer. $Me_2AsH{\cdot}BH_3$ was synthesized; it lost H at temperatures above 50°C to form the trimer of Me_2AsBH_2 and possible higher polymers. Hydrolysis of the trimer yielded CH_4 and H without oxidation of the trivalent As, in contrast to the formation of Me_2POOH from dimethylphosphinoborines. Attempts at direct Si-B bonding were unsuccessful. Me_2SBH_3, prepared by the condensation of Me_2S and B_2H_6, was more stable than $MeSH{\cdot}BH_3$. Me_2S_2 reacted with B_2H_6 to give $(MeSBH_2)_n$; $(MeSBH_2)_x$ did not undergo an addition reaction to $MeSB_2H_5$. H_2S reacted with B_2H_6 slowly at room temperature to form a glassy polymer approximated by the formula $(HBS)_x$. MeSH and $Me_4B_2H_2$ reacted to form liquid $MeSBMe_2$ boiling at 71°C. Removal of BMe_3 from its addition product with Na_2HBMe_2 in Me ether left a solid not extractable by Me ether. (cf. TIP U20064) (TID-LC)

1916

Chicago Univ.

HYDRIDES AND BOROHYDRIDES OF LIGHT WEIGHT ELEMENTS AND RELATED COMPOUNDS: TECHNICAL REPORT FOR THE PERIOD AUGUST 1, 1951 TO JULY 31, 1952, by H. I. Schlesinger and Riley Schaeffer. Aug. 1, 1952. 30p. (NP-4249)

The formula B_4Cl_4 was established by vapor-density measurements. Efforts are continuing to improve the preparation of B_4Cl_4. A comparison of the chemical behaviors of B_2Cl_4 and B_4Cl_4 showed that B_2Cl_4 reacts rapidly and completely with H to produce B_2H_6, BCl_3, and chlorodiboranes, but B_4Cl_4 reacts slowly, if at all, with H. B_2Cl_4 reacts quantitatively with alcohols to form HCl and tetraalkoxydiborines; B_4Cl_4 yields no HCl and no volatile methoxy derivatives with MeOH but produces H and unidentified products. Alkylating agents ($ZnMe_2$, $CoMe_2$) completely decomposed B_2Cl_4 to a nonvolatile black solid material; B_4Cl_4 did not form black solids, but treatment with the reactive methylating agent $AlMe_3$ gave volatile substances, possibly Me derivatives of B_4Cl_4. A study of the reactions of $N_2H_4{\cdot}B_2H_6$ (I) showed no reaction with excess N_2H_4 or B_2H_6, indeterminate reactions with HCl, Me_3N, and MeOH, and H generation on pyrolysis which decreased markedly after 2 moles H had been lost per mole I. $Me_2N_2H_2{\cdot}B_2H_6$ (II) synthesized at –80°C in ether solution was more soluble than I in Et_2O, reacted slowly with moist air, dilute HCl, and HNO_3, and reacted more rapidly with EtOH. II began to evolve H at about 70°C and lost about 2 moles H during the first 15 min at 76 to 83°C; the product underwent further slow decomposition. A volatile liquid assigned the formula $N_2Me_2(BH_2)_2$ was isolated in the thermal decomposition of II. Problems encountered in studying the reaction $3LiBH_4 + LiBF_4 \xrightarrow{ether} 2B_2H_6 + 4LiF$ are summarized. The most satisfactory procedure developed for the preparation of $B_3N_3H_6$ involves the reduction of $B_3N_3H_3Cl_3$ with $LiBH_4$ and the absorption by solid $NaBH(OMe)_3$ of the B_2H_6 generated in the reaction. Alcoholysis of B_5H_9 with tert-BuOH yielded $HB(OBu)_2$ and H. B_5H_9 failed to react with HCl, BCl_3, and BF_3; treatment with $AlCl_3$ in $COCl_2$ yielded a gas consisting of 90% CO and 10% H. An ammoniate formed from B_5H_9 and liquid NH_3 appeared to contain 5 B atoms/molecule. A study of the action of Li on liquid NH_3 solution of B_5H_9 is reported. (cf. TIP U19073) (TID-LC)

1917

Chemical Lab., Univ. of Kan.

TECHNICAL REPORT NO. 2 [ON] THE PREPARATION OF A SOLID RHENIDE, by Justo B. Bravo, Ernest Griswold, and Jacob Kleinberg. [nd] 19p. (NP-4337; Technical Report No. 2; U-25984)

Solid KRe (Science 115, 375-6(1952)) was purified by extraction with isopropyl alcohol. Analysis of the resulting gray solid showed it to be $KRe{\cdot}4H_2O$ of greater than 90% purity. The molar susceptibility at 20°C of the $KRe{\cdot}4H_2O$, corrected for the diamagnetism of the KOH impurity, was about 240×10^{-6} cgs magnetic units. As this degree of paramagnetism is less than that required for a substance with 1 unpaired electron, and the Re atom has 5 unpaired electrons, the formation of the Re ion probably involves a considerable modification in electronic configuration. The magnetic data support the suggestion of Pauling (Chem. Eng. News 25, 2970-3(1947)) that the tetrahydrate has a square planar structure which involves dsp^2 bonds. (TID-LC)

1918

Texas Univ.

THE ELECTROCHEMICAL POLARIZATION OF ZIRCONIUM IN NaCl SOLUTIONS, by Norman Hackerman and Olin B. Cecil. Dec. 1, 1952. 42p. (NP-4338; U-26127)

Cathodic and anodic polarization curves of Zr in neutral

NaCl solution were determined at constant current densities in the range of 3.5×10^{-8} to 3.5×10^{-3} amp/cm^2. All potentials were steady state. In aerated 0.5M NaCl, the cathode reaction occurring below the O limiting diffusion current of 2×10^{-4} amp/cm^2 was the reduction of O to OH. At current densities above the diffusion wave, H was evolved. A change in salt concentration resulted in a slight shift of the diffusion current due to different O solubilities in the different salt concentrations. In deaerated 0.5M chloride solution, the O diffusion current decreased with a decrease in O concentration. The values for the slope of the Tafel line was 0.12, and the H overvoltage was 0.83 v at 1 ma/cm^2. Another wave occurred at 2×10^{-6} amp/cm^2 and can best be explained as the reduction of a surface oxide layer on the metal. Anodically, Zr dissolved in 0.5M NaCl. The dissolution potential, 0.15 v, was constant with a change in current density. Commercial Zr and pure Hf also dissolved under similar conditions. In neutral sulfate solutions, Zr was passive under anodic treatment. At the higher current densities, above 1×10^{-3} amp/cm^2, the potential apparently reached a constant value in about 10 min, followed by a sudden increase in potential to 28.5 v. This high potential was a result of an IR drop across a surface layer of oxide present on the Zr coupon. (auth)

1919

STRUCTURAL CHEMISTRY OF THE ALKOXIDES. PART III. SECONDARY ALKOXIDES OF SILICON, TITANIUM, AND ZIRCONIUM. D. C. Bradley, R. C. Mehrotra, and W. Wardlaw. J. Chem. Soc., 5020-3(1952) Dec.

The secondary alkoxides, $M(O{\cdot}CHR_2)_4$ where R = Me, Et, Pr^n, Pr^i, or Bu^n, and $M(O{\cdot}CHMeR)_4$ where R = Et, Pr^n, Pr^i, Bu^n, Bu^t, or n-hexyl, and M = Ti or Zr, have been prepared, and also isopropyl and sec-amyl orthosilicates. Boiling points and, in some cases, vapor pressures and molecular weights have been measured. The results support the theory that steric effects are most important in determining the physical properties of the alkoxides. Entropies of vaporization for $Si(OPr^i)_4$, $Si(O{\cdot}CHEt_2)_4$, $Ti(OPr^i)_4$, and $Ti(O{\cdot}CHEt_2)_4$ exhibit some anomalous relations which are discussed. (auth)

1920

THE ACTION OF ALCOHOLS ON ZIRCONIUM TETRACHLORIDE AND ZIRCONIUM CHLORIDE ALKOXIDES. D. C. Bradley, F. M. Abd-El Halim, R. C. Mehrotra, and W. Wardlaw. J. Chem. Soc., 4960-3(1952) Dec.

The reactions of Zr tetrachloride and of Zr chloride alkoxides with various alcohols have been examined. From the tetrachloride and methanol the equimolecular mixture of $ZrCl_3(OMe){\cdot}MeOH$ and $ZrCl_2(OMe)_2$ was obtained. Alcohol interchange occurs between Zr dichloride dialkoxides or Zr chloride trialkoxides and primary or secondary alcohols and is a convenient means for preparing Zr chloride alkoxides. The new compounds $ZrCl(OMe)_3$ and $ZrCl_2(OMe)_2$ were thus prepared. With tertiary alcohols and $ZrCl(OPr^i)_3{\cdot}Pr^iOH$ the alcohol interchange was accompanied by a second reaction which formed alkyl halide, olefin, and water, but the new chloride tri-tert-amyloxide or Zr could be prepared by a modified procedure. The nature of the second reaction was investigated, and a mechanism is proposed. (auth)

1921

REACTIONS OF ACETYL CHLORIDE WITH ZIRCONIUM ALKOXIDES. D. C. Bradley, F. M. Abd-El Halim, R. C. Mehrotra, and W. Wardlaw. J. Chem. Soc., 4609-12(1952) Dec.

Reactions of primary, secondary, and tertiary alkoxides of Zr with acetyl chloride have been investigated, and the following new compounds have been prepared: $ZrCl_4{\cdot}Pr^nOAc$; $ZrCl_4{\cdot}2Pr^iOAc$; $ZrCl_2(OPr)_2{\cdot}Pr^iOH$; $ZrCl(OPr^i)_3{\cdot}Pr^iOH$; and $ZrCl(OPr^i)_3$. No HCl was evolved in reactions involving $Zr(OPr^i)_4{\cdot}Pr^iOH$ and acetyl chloride even in the presence of excess of isopropyl alcohol, and $ZrCl_3(OPr^i){\cdot}2Pr^iOH$ was obtained by treating $Zr(OPr^i)_4{\cdot}Pr^iOH$ with HCl. Radical-interchange reactions involving chloride alkoxides of Zr are demonstrated, and mechamisms of radical interchange between chlorides and alkoxides of Si, Ti, and Zr are discussed. (auth)

ANALYTICAL PROCEDURES

1922

Argonne National Lab.

MANUAL OF SPECIAL MATERIALS ANALYTICAL LABORATORY PROCEDURE. Oct. 1952. Decl. with deletions, Feb. 5, 1953. 74p. (AECD-3495)

This manual contains directions for laboratory procedures for the gravimetric peroxide, titrimetric, and fluorophotometric determination of U, the gravimetric determination of U oxides, the radiometric determination of Pu, and the spectrochemical analysis of the heavy elements and their isotopic analysis with the mass spectrometer. A section on weights and balances and selected references on the analytical procedures described are included. (C.R.)

1923

Argonne National Lab.

ANALYSIS OF URANIUM OXIDE-POLYSTYRENE MIXTURES. Oct. 1952. Decl. Feb. 5, 1953. 4p. (AECD-3498; ANL-LFD-316; PC-1386)

U oxide–polystyrene mixtures have been analyzed for nonvolatile material (essentially pure U_3O_8 plus any impurities introduced in the fabricating process) and U. The nonvolatile material is determined by thermal decomposition of the organic matter and ignition of the residue at 800°C. The U content is then determined by dissolving the ash and analyzing for U by a usual method. Samples of ash have been analyzed by emission spectroscopy and found to be low in impurities. (auth)

1924

Argonne National Lab.

THE APPLICATION OF DIFFERENTIAL COLORIMETRY TO THE THIOCYANATE-ACETONE ANALYSIS FOR URANIUM, by C. E. Crouthamel and H. M. Hubbard. Dec. 1952. 11p. (ANL-4940)

The principle of differential colorimetry has been applied to the thiocyanate-acetone analysis for U, and a procedure has been developed for the analysis of uranium solutions which gives a standard deviation of less than 0.3%. Under optimum conditions a standard deviation of 0.1% has been approached. The original colorimetric method for the determination of uranium by the use of ammonium thiocyanate has been modified by Crouthamel and Johnson (ANL-4750). The work reported here is the application of the principle of differential colorimetry to their modified thiocyanate-acetone procedure, and was undertaken in an effort to improve the precision and accuracy of the analytical method. (auth)

1925

Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro (Brazil)

ON THE EMPLOYMENT OF LIQUID EMULSION IN THE TITRATION OF URANIUM FROM RADIOACTIVE MINERALS, by F. A. G. A. Brandão, Elisa Frota-Pessôa, Neusa Margem, and Waldir Perez. Nov. 1952. 11p. (NP-4383; Physics Note No. 6)

A method is briefly outlined for the titration of U in radioactive minerals in which the solution to be titrated is mixed with liquid emulsion. The slide obtained is compared with one containing a standard solution prepared under similar conditions and the percentage of radioactive elements present is determined. (J.E.D.)

1926
THE DETERMINATION OF TRACE ELEMENTS BY NEUTRON RADIOACTIVATION ANALYSIS. G. W. Leddicotte and S. A. Reynolds. ASTM Bull., No. 188, 29-31(1953) Feb. (See also NSA 7-1611)

This paper briefly discusses the technique of neutron activation analysis and its sensitivities and applications. (G.Y.)

1927
INDUCED REACTION METHOD FOR DETERMINATION OF FLUORIDE ION. Jack L. Lambert. Anal. Chem. 25, 271-4(1953) Feb.

Fluoridation of drinking water supplies has increased the interest in quantitative analytical methods for fluoride ion in concentrations of the order of 1 ppm. A fundamentally new method which meets these requirements is worthy of study, as comparatively few methods are sufficiently sensitive for determinations in this range. A quantitative method is based on the speeding up of the reaction between iodide ion and the hydrolysis products of ceric sulfate, which is measured by timing the appearance of the blue linear starch-triiodide (I_3^-) ion complex. The method is capable of good precision in the range from 0.3 to 0.9 ppm. of fluoride ion, but is subject to influence in varying degrees by several substances commonly found in potable waters. As described, this method is probably subject to enough influences to make it inconvenient for routine analyses of public water supplies. Under favorable conditions, the method is shown to be highly sensitive and capable of good precision. (auth)

1928
DETERMINING LOW CONCENTRATIONS OF HAFNIUM IN ZIRCONIUM; A SPECTROGRAPHIC METHOD. D. M. Mortimore and L. A. Noble. Anal. Chem. 25, 296-8(1953) Feb.

The demand within recent months for Zr metal relatively free of Hf has necessitated the development of new spectrographic methods capable of detecting trace amounts of Hf. A spectrographic method is presented for quantitatively determining Hf in Zr in concentrations of 0.003 to 0.4%. The method involves excitation of Zr oxide samples in a direct current arc of 30 amp at 230 v, using a buffer to maintain a smooth arc stream. The third-order ultraviolet spectra are used to minimize the relatively high background encountered with Zr excitation. The precision attained ranges from an average deviation of 13% at 0.006% Hf to 4% at 0.4% Hf. The sensitivity of this method is unusually good and the precision is satisfactory for a routine quantitative method. (auth)

1929
FLUOROPHOTOMETRIC DETERMINATION OF URANIUM. George R. Price, Renato J. Ferretti, and Samuel Schwartz. Anal. Chem. 25, 322-31(1953) Feb.

In the Manhattan Project there was need for a simple and rapid method for running large numbers of U determinations at a high sensitivity level. The fluorophotometric method, using fusion in NaF, had the necessary sensitivity, but was believed to require laborious chemical purification of unknowns. The authors found that the extent to which purities present in samples interfered with fluorescence depended on the concentration of these impurities in the NaF, and was independent of U concentration. Therefore, quenching of fluorescence could be decreased simply by dilution by taking extremely small aliquots, and could be corrected for by "spiking" with known amounts of U, so that chemical purification of samples was almost never necessary. To permit great dilution, the sensitivity of the method was considerably increased in order to give a range of from 10^{-10} to 10^{-5} g of U per 0.3 g of NaF. Over most of this range, it was found that standard errors of less than 10% could be regularly obtained. This method of analyzing without making chemical separation has been thoroughly tested and is in use at the present time in a number of laboratories in the United States and Canada. (auth)

1930
RAPID METHOD FOR DETERMINATION OF URINARY FLUORINE. Russell F. Miller and Paul H. Phillips. Anal. Chem. 25, 172-3(1953) Jan.

In the basic method for fluroine analysis, that of Willard and Winter, which uses a perchloric acid distillation of an alkaline ashed sample, the preliminary alkaline ashing required is time-consuming for routine analysis. A simplified procedure for unashed samples has been developed which has given results comparable to those obtained with the ashing procedure. The essential modification is a 1-to-15 dilution with water instead of the alkaline ashing. (G.Y.)

1931
PRECISION OBTAINED WITH VIBRATING REED ELECTROMETER IN RADIOASSAYING META- AND PARA-SUBSTITUTED BENZOIC-ALPHA-CARBON-14 ACIDS. Vernon F. Raaen and Gus A. Ropp. Anal. Chem. 25, 174-5(1953) Jan.

Under the conditions used in this work the average precision of the over-all process of Van Slyke combustion and radioassaying of various carboxyl-labeled benzoic acids was mean ±0.3% for the approximate 95% confidence interval of the mean of six to nine assays. To obtain such precision it was necessary to perform all the assays on a given sample of acid in 1 day. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

1932
PHASE RELATIONSHIPS IN THE PYRIDINE SERIES. PART II. THE MISCIBILITY OF SOME PYRIDINE HOMOLOGUES WITH DEUTERIUM OXIDE. J. D. Cox. J. Chem. Soc., 4606-8(1952) Dec.

The miscibility of the picolines and of three lutidines with deuterium oxide is studied. α-Picoline is only partially miscible (cf. Timmermans and Poppe, Compt. rend. 201, 608(1935)) as also is β-picoline; γ-picoline is completely miscible. The partial miscibility of β-picoline with deuterium oxide affords a simple method of analyzing deuterium oxide–water mixtures, and a suitable procedure is suggested. (auth)

1933
POTENTIAL FUNCTION OF ETHYLENE. J. Charette and C. Manneback. Ann. soc. sci. Bruxelles Sér. I 66, 178-93 (1952) Dec. 31. (In French)

The coefficients of a plane harmonic potential function for ethylene have been calculated from experimentally determined frequencies of C_2H_4 and C_2D_4. All the plane vibration frequencies of the different deuteroethylenes have been recalculated. Evidence for the important perturbing role of the anharmonicity of certain parameters of the potential function is presented. (tr-auth)

1934
HIGH-DISPERSION INFRARED SPECTRUM OF CD_3Br (2900 to 3400 cm^{-1}). Ch. Courtoy. Ann. soc. sci. Bruxelles Sér. I 66, 173-7(1952) Dec. 31. (In French)

The spectra of several bands of harmonics and their combinations for the CD_3Br molecule have been obtained at high dispersion. The spectra are $3\nu_2$, $\nu_4 + \nu_8$, $\nu_4 + \nu_2$, and probably $\nu_4 + \nu_5$. (tr-auth)

1935
A DEUTERIUM ELECTROLYSIS PLANT. J. T. Lloyd. J. Sci. Instruments 29, 164-5(1952) May.

The extraction of D_2 from D_2O is normally achieved by electrolysis, Na metal being added to provide conduction. The design of a suitable apparatus which will fill an evacuated reservoir or feed an accelerating machine directly, without

constant attention, is rendered difficult by the necessity for preserving balancing pressures in the two sides of the eudiometer. This has been overcome by using a buffer balancing system, one type of which has been described by R. W. Wanieck (Rev. Sci. Instruments 21, 262(1950)). A more compact system is obtained, however, by making use of a valve consisting of a sintered glass filter of the pyrex grade 4 type immersed in Hg. This filter allows the passage of gas but not Hg. The O_2 produced is also allowed to leak out under Hg, the height of which is adjusted initially to counterbalance the pressure exerted by the D_2 in filtering through the sintered glass valve. (Entire paper)

FLUORINE AND FLUORINE COMPOUNDS

1936

Argonne National Lab.

THE REFRACTIVE INDICES OF BROMINE TRIFLUORIDE—BROMINE PENTAFLUORIDE MIXTURES, by Lawrence Stein and Richard C. Vogel. Dec. 1952. 13p. (ANL-4941)

The refractive index of liquid BrF_3-BrF_5 mixtures has been determined as a function of composition by means of a hollow prism and spectrometer. At 25.0°C, for the sodium D lines, the refractive index has been found to obey the equation $n_D^{25} = 1.4536 - 0.1237N + 0.00968N^2 + 0.0137N^3$, where N = mole fraction of BrF_5. (auth)

1937

THE REACTIONS OF HIGHLY FLUORINATED ORGANIC COMPOUNDS. PART II. REACTIONS OF PERFLUORODICYCLOHEXYL AND PERFLUORO(ISOPROPYLCYCLOHEXANE). G. B. Barlow and J. C. Tatlow. J. Chem. Soc., 4695-8(1952) Dec.

Perfluorodicyclohexyl and Cl_2 or Br_2 at 600 to 650° give, principally, chloro- or bromo-undecafluorocyclohexane, respectively. With toluene at about 650° perfluorodicyclohexyl gives undecafluorocyclohexane and dibenzyl. Perfluoro(methylcyclohexane), perfluoro(ethylcyclohexane), and perfluoro(1,2-dicyclohexylethane) do not react in similar processes at these temperatures, whereas perfluoro(isopropylcyclohexane) gives undecafluorocyclohexane with toluene, and bromoundecafluorocyclohexane with Br_2. It appears that, at 600 to 650°, C–C bonds between certain tertiary, C atoms in fluorocarbon structures undergo homolysis, whereas C–C bonds involving primary and secondary C atoms split appreciably only at higher temperatures. Bromoundecafluorocyclohexane gives undecafluorocyclohexane with $LiAlH_4$ in ethereal solution. (auth)

1938

VISCOSITY AND MOLECULAR REACTION DIAMETER OF FLUORINE. E. U. Franck and W. Stöber. Z. Naturforsch. a7, 822-3(1952) Dec. (In German)

The viscosity of gaseous F_2 has been measured by the vibrating-disk method over the temperature range 90 to 470°K, and from these data molecular collision diameters have been calculated. The latter are smaller than those of N_2, O_2, Cl_2, and Br_2, in contradiction to the calculations of Whalley and Schneider (J. Chem. Phys. 20, 657(1952)). (G.Y.)

1939

ORGANIC FLUORIDES. PART XIV. THE SYNTHESIS OF SOME AROMATIC FLUORO- AND CHLORO-COMPOUNDS. L. V. Johnson, F. Smith, M. Stacey, and J. C. Tatlow. J. Chem. Soc., 4710-13(1952) Dec.

Aromatic compounds having $-CCl_3$ or $>CCl_2$ side chains react, in pyridine, with Cu powder, with removal of Cl and consequent dimerization of the organic residues. In this way 1,1,2,2-tetrachloro- and 1,2-dichloro-1,2-diphenylethane and 1,2-dichloro-1,1,2,2-tetraphenylethane were made; further reaction with 1,2-dichloro compounds gives olefins. $-CCl_3$ or $>CCl_2$ side chains adjacent to benzene nuclei are converted into the corresponding trifluoro and difluoro groupings by the use of HF or SbF_3. Difluorodi-p-fluorophenylmethane, 1,1,2,2-tetrafluoro-1,2-diphenylethane, bistrifluoromethylbenzene, and 1,3,5-tristrifluoromethylbenzene were prepared thus from the corresponding chloro compounds. In the first of these compounds the fluorinated group is very readily hydrolyzed; the last three compounds have stable side chains. (auth)

GRAPHITE

1940

Alfred Univ.

TECHNICAL PROGRESS REPORT [ON] GRAPHITIZATION OF CARBON, by V. D. Frechette and Yung Tao. Dec. 31, 1952. 4p. (NYO-3759)

Artificial graphites could not be formed by cold pressing as natural graphites were. A minimum amount of 4% by weight of pitch was necessary for pressing coherent specimens. A density of 1.935 was obtained with 10% pitch pressed at 100°C with a pressure of 10,000 lb/in^2 using 75% 60 to 100 mesh, 20% 100 to 200 mesh, and 5% 200 mesh graphite. (See NYO-3758 for preceding quarter.) (L.T.W.)

1941

FORMED CARBON AND GRAPHITE IN INDUSTRY. L. C. Werking. Am. Ceram. Soc. Bull. 32, 40-4(1953) Feb.

The fundamental properties of carbon and graphite products normally produced in the U.S. and their applications in industry are discussed. (auth)

1942

CLOSED PORES IN SYNTHETIC GRAPHITE. E. M. Dresel and L. E. J. Roberts. Nature 171, 170(1953) Jan. 24.

The real densities of synthetic graphites were measured by the displacement method in three different fluids, methanol, n-hexane, and He. All measured density values of synthetic graphite ranged from 2 to 8.5% lower than those for natural graphite. It is concluded that ~20% of the total pore space of synthetic graphite cannot be reached by a liquid or gas unless the graphite is reduced to a very fine particle size or part of the structure is removed by oxidation. (L.M.T.)

1943

STUDY OF THE PHOTOGENESIS AND ACTIVE METASTABLE CENTERS IN THE COMBUSTION OF GRAPHITE. R. H. Busso. J. chim. phys. 50, 53-9(1953) Jan. (In French)

Investigation of the ultraviolet photogenesis between 1900 and 2800 A during the oxidation of graphite in air at 1500°C and at pressures varying from 10^{-2} to 15 cm of Hg showed the existence in the combustion gas of (1) metastable excited CO_2 molecules with true half lives of several tenths of a second in the pressure domain above 5 cm Hg, and (2) equally metastable excited CO molecules, probably in the $a^3\Pi$ state with true half lives up to 1 sec for pressures below 5 cm Hg. (tr-auth)

1944

SYNTHESIS OF GRAPHITE AT ROOM TEMPERATURES. C. B. Slawson. Am. Mineralogist 38, 50-5(1953) Jan.-Feb.

Available thermodynamic data indicate that the cubic modification of carbon is the stable form at room temperatures and pressures above 15,000 atm. Elemental carbon was formed under pressures as high as 35,000 atm by the reaction: mercuric carbide → mercury + carbon. The carbon was identified as graphite by x-ray powder patterns. The experimental procedure was to enclose the mercuric carbide powder in sealed copper cylinders which were compressed by hydraulically operted tungsten carbide pistons in a hollow steel cylinder. The rate of decomposition was unpredictable and more often than not proceeded explosively. (auth)

1945
INVESTIGATION OF GELS OF GRAPHITIC ACID WITH THE ELECTRON MICROSCOPE. J. Maire and A. Mathieu-Sicaud. Bull. soc. franç. minéral. et cristal. 75, 599-604 (1952) Oct.-Dec. (In French)

The authors have studied the products formed by action of Brodie's solution ($KClO_3$ in fuming HNO_3) on graphites which had various graphitization rates. The corresponding graphitic acids and the Na graphitates obtained by treatment with NaOH were examined with the electron microscope. The parallelism between the properties of suspensions (tendency to gel formation, for example) and the microscopic aspects of the particles (more or less continuous membranes) is pointed out. 8 figures. (tr-auth)

1946
ANISOTROPIC SUSCEPTIBILITY OF POLYCRYSTALLINE GRAPHITE. W. P. Eatherly and J. D. McClelland. Phys. Rev. 89, 661-2(1953) Feb. 1.

The spur invariance of the susceptibility tensor for anisotropic polycrystals is proved by mathematical analysis. The measured total susceptibility for various Atcheson graphites fell in the range -20.5×10^{-6} to -21.2×10^{-6} cgs. The anisotropy ratio for the manufactured graphites ranged from 1:1 to 9:1. The experimental results are compared with those of other workers. (L.T.W.)

LABORATORIES AND EQUIPMENT

1947
Argonne National Lab.
A REMOTELY CONTROLLED PIPETTING APPARATUS FOR RADIOISOTOPES, by Walter E. Kisieleski and Donald F. Uecker. Jan. 1953. 7p. (AECU-2405; UAC-696)

The design and working specifications for a remote-control pipetting apparatus are presented. An experimental setup for the dispensing, diluting, and sampling of radioactive solutions is shown photographically. (auth)

1948
VACUUM CLEANER FOR RADIOACTIVE DECONTAMINATION. F. R. Holden, R. K. Skow, and J. Todd. Nucleonics 11, No. 2, 67(1953) Feb.

A modified industrial tank-type vacuum cleaner for radioactive decontamination of both solid and liquid spills is described. Modification requires an upper and lower adapter, the ends of which fit onto the appropriate cleaner unit and onto the face of a high-efficiency filter. Solid or liquid spills are drawn into the tank, where several inches of water catch the bulk of the material, and fine particles are trapped by the filter. The inside of the tank is coated with strippable film to facilitate its decontamination. (L.T.W.)

RADIATION CHEMISTRY

1949
METHODS OF SEPARATION AND IDENTIFICATION OF NUCLEAR ISOMERS. M. G. Kayas. Ann. phys. (12) 7, 802-51(1952) Nov.-Dec. (In French)

A method for separating the modified chemical species resulting from isomeric transition by means of organic ion exchangers is proposed. Application of the method to Br^{80} resulted in good separation of the carrier-free ground state. No isomeric separation was observed in the case of Zn^{69}, probably because of the weak internal conversion of the photons emitted by this nuclide. (G.Y.)

RADIATION EFFECTS

1950
IRRADIATED 3,4-BENZOPYRENE. II. Giulio Milazzo and Harold A. Frediani. Rend. ist. super. sanità 15, 1065-73 (1952). (In Italian)

After a sufficiently long period (about 7 yr, corresponding in order of magnitude to 3×10^6 r/cm^3) of exposure to the action of the ionizing radiation from $RaCl_2$, benzopyrene in hexane solution was examined by ultraviolet absorption and by fluorescence. One part of the irradiated product, after elimination of the hexane solvent, was redissolved in CCl_4 and its infrared spectrum was examined. This inquiry, together with chemical observations, has brought to light such variations that it is possible to state definitely that benzopyrene exposed to the action of ionizing radiation is in part transformed. Almost certainly one of the resulting compounds is an oxidized product, perhaps a quinone. (auth)

RARE EARTHS AND RARE-EARTH COMPOUNDS

1951
THE ANALYSIS OF INORGANIC COMPOUNDS BY PAPER CHROMATOGRAPHY. PART V. THE SEPARATION AND DETECTION OF CERTAIN LANTHANONS. F. H. Pollard, J. F. W. McOmie, and H. M. Stevens. J. Chem. Soc., 4730-4(1952) Dec.

A preliminary account is given of the application of complex-forming mobile phases to the separation on paper and cellulose columns of mixtures of (1) La, Ce, Pr, or Nd, and Yb; (2) Y and La; (3) Y, La, and Ce; (4) Y, La, and Yb; (5) Y and Er from Ce; and (6) Y and Er from La. Their detection on paper is also described. (auth)

1952
ABSORPTION SPECTRA OF THE RARE EARTHS. F. Boulanger. Ann. chim. (Paris) (12) 7, 732-71(1952) Nov.-Dec. (In French)

Results of investigations on the absorption spectra of numerous rare-earth compounds and complexes, both solid and in solution, are reported. A bibliography of 275 references is included. (G.Y.)

1953
THE SEPARATION OF THE LANTHANONS WITH THE AID OF ETHYLENEDIAMINE-TETRA-ACETIC ACID ("ENTA ACID"). PART IV. SODIUM LANTHANON SULPHATE PRECIPITATION FROM SODIUM LANTHANON ENTA SOLUTION. J. K. Marsh. J. Chem. Soc., 4804-11(1952) Dec.

Comparison of precipitation of Na lanthanon sulfate from ordinary cationic lanthanon solutions, and from solutions of, mainly, Na lanthanon enta but containing also some cationic lanthanon shows much sharper segregation of individual elements in the case of the enta solutions. The selective action of double Na sulfate precipitation is augmented by a selective rejection from the enta complex of the more strongly basic elements. Least advantage is gained for the triad Dy, Ho, and and Y, the exact position of the last depending upon experimental conditions. A salt $4Na[Ln\ enta]{\cdot}H_4enta{\cdot}24H_2O$ reported in part III (NSA 6-842) is in fact $Na[Ln\ enta]{\cdot}6H_2O$. (auth)

SEPARATION PROCEDURES

1954
Argonne National Lab.
PAPER CHROMATOGRAPHY OF CHLOROPLAST PIGMENTS: SORPTION AT A LIQUID-LIQUID INTERFACE, by Harold H. Strain. Jan. 1953. 17p. (AECU-2407; UAC-707)

The interface between two immiscible liquids, such as water and petroleum ether, exhibits selective affinity for chloroplast pigments. With water or aqueous solutions fixed in porous filter paper, this sorption at the interface between the liquids serves for the chromatographic separation of mixtures of chloroplast pigments dissolved in petroleum ether. With counter flow of water droplets and petroleum ether solutions of the pigments, sorption at the liquid-liquid interface may be utilized for the continuous resolution of the mixtures into two principal fractions, the more-sorbed and the less-sorbed components. (auth)

1955

ELECTROCHROMATOGRAPHY ON PAPER OF LANTHANIDES AND LANTHANUM HOMOLOGS. Michael Lederer. Compt. rend. 236, 200-1(1953) Jan. 12. (In French)

Separation of Sc, Sm, Nd, Y, Ce, Pr, La, and Ac by paper electrochromatography is described. The Sc and Ac were followed by tracer techniques, the rare earths by the colors formed with 8-quinolinol. (G.Y.)

SPECTROSCOPY

1956

Argonne National Lab.

REFLECTION SPECTRA OF SOME SOLID COBALT (II) SALTS IN THE VISIBLE REGION, by Leonard I. Katzin and Elizabeth Gebert. Dec. 19, 1952. 14p. (AECU-2409; UAC-693)

Reflection spectra are presented for a number of solid hydrates and pyridinates of cobaltous salts, and for double salts of cobaltous chloride with Cs chloride and pyridinium chloride. Correlations between the solid and solution spectra, and crystal structures, are pointed out. (auth)

SYNTHESES

1957

Radiation Lab., Univ. of Calif., Berkeley

INCORPORATION OF ADENINE INTO NUCLEOTIDES AND NUCLEIC ACIDS OF C57 MICE, by Edward L. Bennett. Dec. 1952. 26p. (UCRL-2027)

Intraperitoneally administered adenine-4,6-C^{14} is rapidly and extensively incorporated into nucleotides and nucleic acid by C57 mice. The incorporation rate of adenine into the PNA indicates a pathway involving little or no dilution, therefore not thru the general 5-adenylic acid pool. The half life of the nucleotide fraction was found to be 2.5 days in the liver, 13 hours and 3.5 days in the stomach and intestines, and 12 days in the carcass, whereas the PNA adenine had a half life of 7 to 8 days in the liver, 3.5 days in the stomach and intestines, and 8 days in the carcass. The most rapid incorporation of adenine in the PNA of the liver occurred in the nuclear fraction and the least rapid in the microsomal fraction. (auth)

1958

PREPARATION OF A TRITIATED SELF-LUMINESCENT MATERIAL. Irving A. Berstein, Winifred Bennett, Melvin Fields, and Earle C. Farmer. Nucleonics 11, No. 2, 64-6 (1953) Feb.

Tritiated trans-stilbene was synthesized in an effort to prepare tritiated self-luminescent materials of less hazard in handling and shielding, of constant luminosity, and of easier synthesis. Apparatus and procedure for tritiation of multiple bonds are described. A solution of diphenylacetylene in dry benzene and Pd on $CaCO_3$ catalyst were placed in a hydrogenation bottle. The tritiations were conducted according to the described procedure. The resulting mixture was filtered through celite to separate the catalyst, the benzene solvent removed, and the resulting cis-stilbene pipetted into a bomb tube, frozen in liquid N_2, degassed, refrozen, and sealed under vacuum. The tube was placed in a furnace at 315°C for 1½ hr. The trans-stilbene was then purified by chromatographic adsorption on alumina and elution with n-pentane. (L.T.W.)

TRACER APPLICATIONS

1959

Kedzie Chemical Lab., Mich. State Coll.

POSSIBLE ORIGINS OF THE METHOXYL CARBON OF LIGNIN FORMED BY HORDEUM VULGARE, by John H. Flokstra, Richard U. Byerrum, Lovell J. Dewey, and Charles D. Ball. [nd] 24p. (AECU-2415)

The methyl groups of methionine were shown to be transferred directly to form the methoxyl groups of lignin in barley, a reaction which was a direct transfer of methyl groups from sulfur to oxygen. Formate was also demonstrated as a precursor of lignin methoxyl groups, but when methionine and formate were administered in equimolar quantities, about 20 methoxyl groups were formed from the methyl of methionine for each methoxyl arising from formate. It was indicated that both the incorporation of the carbon of formate and of methyl groups of methionine into lignin represented a synthesis of a part of the lignin molecule. (auth)

1960

OXYGEN EXCHANGE BETWEEN NITRIC ACID AND WATER. PART I. C. A. Bunton, E. A. Halevi, and D. R. Llewellyn. J. Chem. Soc., 4913-16(1952) Dec.

The exchange of O atoms between HNO_3 and H_2O has been followed by using heavy oxygen as an isotopic tracer. At low acid concentrations the reaction is highly dependent upon "nitrous acid," but at higher nitric acid concentrations a reaction is observed in the absence of "nitrous acid." The reaction rate increases rapidly with increasing concentration of nitric acid. The mechanism of this exchange is discussed in detail in part II (J. Chem. Soc., 4917-24(1952)). (auth)

1961

DIFFUSION AND MIGRATION OF Cs^{137} ION IN NaCl SINGLE CRYSTALS. Marius Chemla. Compt. rend. 236, 484-6(1953) Feb. 2. (In French)

The diffusion coefficient D and mobility V of the positive Cs^{137} ion, carrier-free, in NaCl single crystals was measured over the temperature range 550 to 750°C. The activation energy was found to be 1.85 ev. The results well verify the Einstein equation $V/D = e/kt$. (tr-auth)

TRANSURANIC ELEMENTS AND COMPOUNDS

1962

Radiation Lab., Univ. of Calif., Berkeley

HEAT AND FREE ENERGY OF THE REACTION $AmCl_{3(s)} + H_2O_{(g)} = AmOCl_{(s)} + 2HCl_{(g)}$, by C. W. Koch and B. B. Cunningham. Nov. 10, 1952. Decl. Feb. 4, 1953. 8p. (AECD-3493; UCRL-2006)

Equilibrium constants for the reaction $AmCl_{3(s)} + H_2O_{(g)} = AmOCl_{(s)} + 2HCl_{(g)}$ have been measured at various temperatures between 682 and 880°K. These data have been combined with an estimated ΔC_p function of $2.8 - 0.36 \times 10^{-3}T + 0.44 \times 10^{5}T^{-2}$ to give the free energy function

$$\Delta F^\circ \text{ (kcal)} = 22.38 + \frac{6.4T \log T}{1000} + 1.8 \times 10^{-7}T^2 - \frac{22}{T} - \frac{52.31T}{1000},$$

which agrees with the experimental data within an average deviation of +0.04 kcal. Extension of the free-energy function to temperatures well outside of the experimental range, however, involves a greater uncertainty (perhaps of the order of a kcal at room temperature) because of possible error in the ΔC_p function. Calculated thermodynamic constants for the reaction are as follows:

$\Delta F^\circ_{785} = -4.06$ kcal; $\Delta H^\circ_{785} = 20.01$ kcal; $\Delta S^\circ_{785} = 30.6$ eu

$\Delta F^\circ_{298} = +11.45$ kcal; $\Delta H^\circ_{298} = 21.38$ kcal; $\Delta S^\circ_{298} = 33.3$ eu

The thermodynamic properties of this reaction are similar to those of the corresponding reactions of La, Sm, Gd, and Pu. The free energy of the hydrolysis reaction appears to be determined with surprising exactitude by the ionic radius of the cation. (auth)

1963

A THEORY OF THE PARAMAGNETISM OF URANYL-LIKE IONS. R. J. Elliott. Phys. Rev. 89, 659-60(1953) Feb. 1.

Recent published results on the paramagnetism of PuO_2^{++}

and NpO_2^{++} are discussed, and a formula is given for the effective magnetic moment of a powdered crystal containing these ions. The theoretical dependence of the moment on temperature is given, together with measurements on $(Na(NpO_2)(C_2H_3O_2)_3$. It is concluded that the paramagnetism must arise from an f electron with orbital angular momentum of 3. $(PuO_2)^{++}$ has two electrons of a similar kind, and if the electrostatic interaction between them is small, the lowest state has no orbital angular momentum and a total spin of one. The theoretical susceptibility is 2.83 over the range 0 to 300°K, compared with an experimental value of 2.82. (L.T.W.)

URANIUM AND URANIUM COMPOUNDS

1964

PREPARATION, MELTING POINT, AND SPECIFIC CONDUCTIVITY OF UO_2Cl_2. Leonhard Ochs and Fritz Strassmann. Z. Naturforsch. b7, 637-9(1952) Dec. (In German)

$UO_2Cl \cdot xH_2O$ can be obtained by action of $HCl + H_2O_2$ on U_3O_8 and evaporation of the resulting yellow solution to dryness. Slow heating in a $HCl-Cl_2$ stream causes the uranyl chloride to give up its water of crystallization, so that pure, anhydrous UO_2Cl_2 is obtained. The melting point was determined to be 578 ± 3°C, and the specific conductivity of the melt satisfied the equation $\underline{x} = 0.043 + 0.000371\ (T-578) \pm 0.003$ mho/cm. (tr-auth)

WASTE DISPOSAL

1965

Brookhaven National Lab.

ULTIMATE DISPOSAL OF RADIOACTIVE WASTES, by L. P. Hatch. Jan. 1953. 20p. (BNL-1345)

A general discussion is given of the problem of storage and disposal of industrial radioactive wastes. The problem is attacked, speculatively, from the standpoint of electrical power, assuming that in the future a certain percentage of the electrical power of the world will be supplied by nuclear reactors. The possibilities of using one of the natural clays (montmorillonite) to combine with the radioactive element, an investigation underway at Brookhaven National Lab., is briefly discussed. (L.M.T.)

1966

New York Univ.

PROGRESS REPORT FROM JULY 1, 1951–AUGUST 30, 1952, [ON] TREATMENT OF SYNTHETIC LAUNDRY WASTE ON TRICKLING FILTERS, by William E. Dobbins, Gail P. Edwards, and Richard Ehrenreich. Nov. 1952. 12p. (NYO-4506)

Preparatory to studies on the removal of radioactivity from low-level liquid wastes, a nonradioactive solution simulating the laundry waste from the Knolls Atomic Power Laboratory has been treated on trickling filters. The results indicate that healthy, normal biological conditions accompanied by a high degree of removal of Biochemical Oxygen Demand can be obtained under a wide range of loading conditions. (auth)

ENGINEERING

1967

Radiation Lab., Univ. of Calif., Berkeley

INSTRUCTION MANUAL FOR DC PORTABLE VAPOR DETECTOR MODEL 3EPS, by C. S. Presenz. Nov. 20, 1952. 23p. (UCRL-2033)

Design and operation are described of a d-c portable vapor detector whose operation is based upon principles of spectrum absorption. Vapor detection is quantitative and an audio alarm circuit eliminates the need for constant supervision by the operator. The unit was designed for the detection of Hg vapor, but reacts to a number of other vapors. Test results with 22 vapors commonly present in industrial operations are included. (C.R.)

AEROSOLS

1968

PRECIPITATION OF RADIOACTIVE PARTICLES IN AN INTENSELY IONIZING ELECTRIC FIELD. Marcel Pauthenier and René Challande. Compt. rend. 236, 69-70 (1953) Jan. 5. (In French)

The effectiveness of a tubular electrostatic precipitator was studied by using powdered natural radioactive minerals, which were precipitated on film lining the tube wall. The film was cut into sections, which were then inserted into a G-M counter. Complete precipitation of the powders was noted. (G.Y.)

1969

A SEDIMENTATION BALANCE FOR PARTICLE SIZE ANALYSIS IN THE SUB-SIEVE RANGE. W. Bostock. J. Sci. Instruments 29, 209-11(1952) July.

A method is described for estimating the particle-size distribution (Stokes' diameters) of insoluble powders in the sub-sieve range. The powder is dispersed in a suitable liquid and the particles allowed to settle on to the pan of a torsion balance. The cumulative weight settled is read at chosen time intervals by direct deflection of the torsion wire. An alternative method is to use the return twist of the torsion wire. The size distribution by weight within the particulate mass is deduced from the curve relating the cumulative weight with time, the procedure adopted for calculation being described. (auth)

HEAT TRANSFER AND LIQUID FLOW

1970

Argonne National Lab.

A STABLE NUMERICAL SOLUTION FOR TRANSIENT HEAT FLOW, by George Leppert. Jan. 15, 1953. 21p. (AECU-2397; UAC-706)

An implicit finite-difference formula for the numerical integration of the heat conduction equation is described. It is shown to offer considerable saving in computing time compared to previously used methods for some types of problems. A simple algebraic procedure is developed which facilitates the computation on a desk-type calculating machine and removes the necessity for either iteration or tedious successive substitution at each time step. The accuracy of the method is discussed in terms of its convergence and stability with the aid of a simple example whose analytical solution is known. Although the outstanding advantage of the new method is its stability for large time steps, its convergence error also tends to be smaller than for the explicit formula usually used in these problems. (auth)

1971

Argonne National Lab.

TWO-PHASE PRESSURE DROP AND BURNOUT USING WATER FLOWING IN ROUND AND RECTANGULAR CHANNELS, by W. H. Jens and P. A. Lottes. Oct. 1, 1952. 44p. (ANL-4915)

Two-phase pressure-drop data and burnout data are reported for a vertical rectangular channel with upflow of water within the channel. Burnout data are also reported for upflow of water through a vertical pipe. A comparison is made between experimental and calculated pressure drops. The Martinelli-Nelson method of calculating two-phase

pressure drop is used with a suitable correction for hydrostatic head. Burnout data indicate that vertical channels or tubes with upflow of water within the tubes will not overheat or burn out until the value of exit quality ranges from 70 to 100% for the range of variables: inside diameter, 0.1 to 1 in.; length-diameter ratio, >40; heat flux, up to 300,000 Btu/hr-ft^2; inlet subcooling, up to 150°F; and exit pressure, 14.7 psia. Extrapolation to other ranges is not recommended. The effect of length-diameter ratio on the value of exit quality at burnout is also given. (auth)

1972

Brookhaven National Lab.
ACTIVATION ENERGY FOR VISCOUS FLOW AND SHORT RANGE ORDER, by G. J. Dienes. [nd] 16p. (BNL-1336)

Viscosity-temperature properties of many systems are characterized by highly temperature-dependent activation energies for viscous flow. It is generally recognized that structural changes taking place in the material as a function of temperature are responsible for this phenomenon. In this paper a formulation of viscosity-temperature relations is presented in which the structural changes are explicitly taken into account by means of the formalism of short-range order as a function of temperature. The resulting equation is shown to be a generalization of several semi-empirical equations in current use. The equation has been applied to several glasses, high polymers, and water and has been found to describe the experimental viscosity data with high accuracy over a wide temperature range. (auth)

1973

Applied Science Research Lab., Univ. of Cincinnati
PROGRESS REPORT NO. 5 [ON] A STUDY OF POROUS MEDIA BY MEANS OF FLOW METHODS [FOR] JULY 1, 1952 to SEPTEMBER 30, 1952, by John Ross and Gerard Kraus. Oct. 9, 1952. 11p. (NP-4345; Progress Report No. 5)

In a preceding report the total surface area of a porous medium was determined from transient gas flow rates in the Knudsen regime by the method of Barrer and Grove (Trans. Faraday Soc. 47, 837(1951)), but the method of surface-area calculation is fundamentally different from that of Barrer and leads to areas in agreement with N_2-adsorption methods. In the present paper possible deviations from the theory and sources of error in the transient Knudsen flow method are discussed. The method is applied to surface area determination of P-33 carbon black. (L.T.W.)

1974

Columbia Univ. School of Engineering
[PROGRESS REPORT ON] HYDRODYNAMIC ASPECTS OF LOW VISCOSITY FLUIDS [FOR] JUNE 1, 1952 TO AUGUST 31, 1952, by C. F. Kayan, G. F. Boeker, D. D. Fuller, R. T. Corry, and R. Eisenstadt. Issued Sept. 3, 1952. 72p. (NYO-3736)

A study of certain journal bearings when operating hydrodynamically in low viscosity fluids is reported. The aspects of the problem treated are: (1) theoretical and experimental determination of eccentricity, minimum film thickness, and friction loss of bearings operating under constant unidirectional loads, (2) theory for full journal bearings when the load is not a constant, unidirectional one, (3) design of new pivoted-shoe bearings from theoretical analysis of existing ones, (4) verification of (2) and (3) by operation of a test machine equipped first with old-type bearings and then with pivoted shoe journal bearings, and (5) discussion of future development and research work for the design of a pump or agitator to operate successfully in process fluids. (L.M.T.)

PUMPS

1975

Babcock and Wilcox Co.
PERFORMANCE AND THEORY OF A NEW DESIGN OF HIGH-TEMPERATURE ELECTRO-MAGNETIC PUMP; TECHNICAL REPORT NO. II, by H. G. Elrod and R. R. Fouse. July 13, 1951. 53p. (DC-51-7-15; B&W-5219; Tech. Report No. 2)

This report describes a push-pull design of a-c electromagnetic pump in which interaction of the electrical pumping current with the applied magnetic field is eliminated. Fabricating details of a particular, small-size pump are given. This pump has circulated Li for hundreds of hours at 1600°F. The theory of operation has been studied to determine the effects of electrical supply frequency, wall short-circuiting, and velocity distribution in the pumping section. (auth)

VACUUM SYSTEMS

1976

A FLEXIBLE VACUUM JOINT. J. H. Fremlin. J. Sci. Instruments 29, 267(1952) Aug.

To obtain a limited relative movement of two large sections of a demountable vacuum system, it is usual to use a metal bellows. In the alternate method described, a flange on the main vacuum system and a flange on a moving shaft are joined by a length of rubber tube, which is prevented from collapse due to atmospheric pressure by a helical wire spring. The rubber tube is clamped to the flanges, which have circumferential grooves to prevent slipping, by brass bands. (L.T.W.)

1977

DEMOUNTABLE VACUUM SEALS, J. R. W. Smith. J. Sci. Instruments 29, 131(1952) Apr.

Three vacuum seals are described which utilize glass or metal end plates and which may be readily taken apart for stoving, cleaning, etc. In a vacuum system incorporating up to 8 of these seals using a silicone oil pump, pressures as low as 3×10^{-6} mm of Hg were obtained. (L.T.W.)

1978

THE DESIGN OF HIGH VACUUM VALVES. L. Riddiford and H. Lilley. J. Sci. Instruments 29, 296-7(1952) Sept.

Vacuum valves which are particularly useful for air locks or coupling high-vacuum vessels together are described. They enable equipment to be passed by means of a shaft from the air lock to the main vessel or allow a beam of radiation to pass from one vessel to another. (L.T.W.)

1979

SHUNTED THERMOCOUPLE VACUUM GAUGE. N. A. Florescu. J. Sci. Instruments 29, 298(1952) Sept.

A simple device for increasing the sensitivity of the thermocouple vacuum gage, without any change in the electric circuit, by connection of a shunt in the heater circuit inside the gage is presented. The change in resistance of a conductor increases the sensitivity of the gage. Two resistances, one constructed of Nichrome and eureka and the other of Mo, are connected in parallel and heated by a-c voltage. At low pressures the rate of heat transfer determines the temperature and also the increase in the resistance of the shunt. Therefore the pressure is proportional to the temperature and resistance of the shunt, the heater current will be greater, and the microammeter in the thermocouple's circuit will indicate a larger current. With a suitable heating current in the heater and shunt, it is possible to obtain an appreciable increase in sensitivity and accuracy for pressures below one μ of Hg. (L.T.W.)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

1980

BALL MILLING OF PURE CERAMIC BODIES. H. Zane Schofield. Am. Ceram. Soc. Bull. 32, 49-51(1953) Feb.

Experience in the laboratory is reviewed on ball milling pure ceramic bodies to very fine grain sizes without contamination. Mills lined with beryllium, carbon, or rubber, and employing balls of beryllium, zirconium, zirconia, magnesia, and carbon, have been used successfully in various combinations to mill beryllia, zirconia, magnesia, zirconium carbide, and graphite. (auth)

1981

COMPRESSION STRENGTH OF POROUS SINTERED ALUMINA AND ZIRCONIA. 9th COMMUNICATION TO CERAMOGRAPHY. Eugene Ryshkewitch. J. Am. Ceram. Soc. 36, 65-8(1953) Feb.

The influence of controlled porosity on the compression strength of sintered pure alumina and of partly magnesia-stabilized zirconia was investigated. Bodies with porosities ranging from approximately 3 to 60% by volume were prepared utilizing H_2O_2 to induce pore formation. Cubes of approximately 1.2-cm unit length were used in testing for compression strength at room temperature. The spatial arrangement of pores in sintered alumina was found to exert an influence, inasmuch as bodies with pores lined parallel to the pressure direction revealed a higher strength than bodies of the same porosity but with pores lined mainly perpendicular to this direction. It was found that an increase of porosity by 10 vol.% decreased the strength of both sintered alumina and sintered zirconia by half their initial respective values. (auth)

GEOLOGY AND MINERALOGY

1982

Geological Survey

RECONNAISSANCE FOR RADIOACTIVE DEPOSITS IN THE VICINITY OF TELLER AND CAPE NOME, SEWARD PENINSULA, ALASKA, 1946-47, by M. G. White, W. S. West, and J. J. Matzko. 1953. 10p., 2 illus. (GS-C-244)

Placer-mining areas and bedrock exposures near Teller on the Seward Peninsula, Alaska, were investigated in June and July, 1946, for possible sources of radioactive materials. The areas that were investigated are: Dese Creek, southeast of Teller; Bluestone River basin, south and southeast of Teller; Sunset Creek and other small streams flowing south into Grantley Harbor, northeast of Teller; and, also northeast of Teller, Swanson Creek and its tributaries, which flow north into the Agiapuk River basin. No significant amount of radioactive material was found, either in the stream gravels or in the bedrock of any of the areas. A heavy-mineral fraction obtained from a granite boulder, probably derived from a bench gravel on Gold Run, contains 0.017% equivalent U, but the radioactivity is due to allanite and zircon. The types of bedrock tested include schist, slate, and greenstone. Readings on fresh surfaces of rock were the same as or only slightly above the background count. The maximum radioactivity in stream concentrates is 0.004% equivalent U in a sluice concentrate from Sunset Creek. An early report on the Cape Nome area, Seward Peninsula, Alaska, stated that granitic rocks there contain allanite as a common accessory mineral. Results of studies in 1947 indicate that very little allanite is present, and that the slight amount of radioactivity of the granitic complex is attributable to the accessory minerals zircon and sphene. (auth)

1983

National Research Council, Div. of Geology and Geography

REPORT OF THE COMMITTEE ON THE MEASUREMENT OF GEOLOGIC TIME [FOR] 1951-1952. 1953. 157p. (NP-4362)

Progress of the work on the measurement of geologic time by isotopic ratios is outlined. An annotated bibliography of abstracted articles related to the measurement of geologic time and research related to radioactivity in the Department of Geology and Geophysics at M.I.T. are included. Methods of age determination of the earth; the radioactivity of K and the thermal regime of the earth; natural variations in isotopic ratios of the chemical elements; recent work on natural variations in stable isotopes; and brief note from a report from the Geological and Mineralogical Inst. of Kyoto Univ. are also included. The preceding report in this series is NP-3801. (J.E.D.)

1984

Department of Mines and Technical Surveys (Canada)

ELECTRONIC CONCENTRATION OF ORES WITH THE LAPOINTE PICKER BELT, by C. M. Lapointe and R. D. Wilmot. 1952. 44p. (NP-4384; Memo No. 123)

The application of the picker-belt system to the concentration of radioactive ores by electromechanical means is described. Suggested flowsheet and circuit drawings of the electrical system are given. (J.E.D.)

1985

RADIOACTIVITY OF SPHENE CRYSTALS CONTAINED IN THE GRANITE OF PLOUMANAC'H, COTES-DU-NORD. R. Coppens. Bull. soc. franç. minéral. et cristal. 75, 584-90(1952) Oct.-Dec. (In French)

The rose granite of Ploumanac'h, France, emits 2.4×10^{-3} α particles/cm^2/sec. This is of the same order of magnitude as that in granites studied to date; however, it can be classified among the most active. The activity is due principally to the inclusions (apatite, zircons, sphenes, and, without doubt, allanite). All the sphene crystals examined had nearly the same activity, a weak average emission of 0.015 α particles/cm^2/sec, which corresponds to a U content of the order of 8×10^{-5}. Certain inclusions seem to contain up to 10% U. Also noted were "radioactive zones" without apparent inclusions and the emission of α particles from the line of separation of biotite crystals. (tr-auth)

METALS AND METALLURGY

1986

Battelle Memorial Inst.

THE RECLAMATION OF ZIRCONIUM MACHINING CHIPS TO PRODUCE ARC-MELTING FEED STOCK, by R. W. Dayton, C. M. Allen, and W. U. Eberts. Oct. 24, 1952. Decl. with deletions Feb. 4, 1953. 10p. (AECD-3499; BMI-RWD-102)

Zirconium of low hardness, suitable as feed for the arc furnace, was obtained by the reclamation of machined Zr chips by a process of washing, leaching, and pickling. (J.E.D.)

1987

Atomic Energy Research Establishment, Harwell, Berks (England)

SOME OBSERVATIONS ON THE CLEAVAGE FACE OF ZINC CRYSTALS, by P. L. Pratt and S. F. Pugh. Oct. 17, 1952. 15p. (AERE-M/R-1031)

Cleavage markings, low angle mosaics, and twins formed before and after cleavage, seen under the opaque-stop microscope, are related to the mechanism of the cleavage process. The steady growth of twins and kinks and the mobility of mosaic boundaries are described in crystals deformed on the stage of the microscope, and the results are discussed in terms of the mobility of arrays of dislocations. (auth)

1988

Battelle Memorial Inst.

CREEP OF 4S-O, J51S, AND NUMBER 22 BRAZING-SHEET ALUMINUM ALLOYS AT 300 F, by H. A. Saller, J. A. VanEcho, G. R. Remely, and J. T. Stacy. Jan. 9, 1953. 26p. (BMI-797)

Creep-rupture tests were made on three aluminum-alloy sheet stocks, 4S-O, heat-treated J51S, and Number 22 brazing sheet, at 300°F in air. Results of these tests indicate the following calculated stresses in psi to produce given creep:

Material	100-hr Rupture	0.001% per hr Minimum Creep Rate	0.0001% per hr Minimum Creep Rate
4S-O	18,300	12,500	<10,000
J51S	26,500	20,000	13,500
No. 22 brazing sheet	22,100	15,000	11,000

The 1st was in annealed condition, the 2nd and 3rd quenched and aged. Lower quenching rates were found to decrease the creep strength of No. 22. (auth)

1989

Brookhaven National Lab.

EFFECTS OF NUCLEAR RADIATIONS ON THE MECHANICAL PROPERTIES OF SOLIDS, by G. J. Dienes. [nd] 35p. (BNL-1340)

Current theoretical understanding of the mechanical properties of solids is critically evaluated, and the effect of nuclear radiation on these properties is discussed in detail. It is shown that the changes in the mechanical properties of crystalline substances (mostly metals) can be quite satisfactorily interpreted on the basis of the production of interstitial atoms and vacant lattice sites by fast-particle irradiation. Isolated vacancies and interstitials may not be able to account for all the observations and attention is called to the possible need for postulating the existence of aggregates of these lattice defects. In molecular solids (mostly high polymers) nuclear radiations bring about changes in the substance which are best described as chemical ones. Ions and free radicals are formed leading to subsequent chemical reactions thereby altering the properties of the substance. Drastic changes in the mechanical properties of high polymers are observed. Correlation with structural changes has hardly been started. Experiments are suggested which, in the writer's opinion, should give further insight into the fundamental processes involved. (auth)

1990

Metallurgical Labs., Dow Chemical Co.

FINAL REPORT [FOR] DECEMBER 1, 1949–NOVEMBER 30, 1952, [ON] PREPARATION OF HIGH PURITY MAGNESIUM AND A STUDY OF THE EFFECT OF NON-METALLIC AND ALKALI METAL IMPURITIES ON THE CORROSION CHARACTERISTICS OF PURE MAGNESIUM. [nd] 24p. (COO-117)

A study of sublimation and multiple sublimation was made in an effort to produce the highest-purity magnesium possible. The effect of sublimation conditions, type of charge metal, various filter media, and apparatus design on the purity of the sublimed metal was evaluated. Further purification beyond two successive sublimations caused no improvement to the corrosion properties. The effect of various crucible materials on the purity of the metal was also investigated. Methods developed for concentrating impurities in multiple sublimates to detectable levels proved useful in a qualitative manner. Corrosion studies, of high-purity Mg containing uniform dispersions of C, Mg_2C_3, Cl, Mg_3N_2, MgO, P, S, Ba, K, Li, and Sr showed no detrimental effects from these additions. C, Mg_2C_3, Cl, and S also had no effect on Mg-Fe alloys. However, segregated nonmetallics do appear to cause crevice corrosion with resulting high corrosion rates. Si, Ca, and Na have a very slight detrimental effect on pure Mg. Si has a dual effect in Mg-Fe alloys, being detrimental in the low-Fe alloys and beneficial to a minor degree in the high-Fe alloys. Phosphorus was significantly beneficial in Mg-Fe alloys when present to >3 times the Fe content. A lower tolerance limit (~60 ppm) and a critical range (100 to 200 ppm) for Fe in Mg was found. Significant changes caused by thermal history and heat treatment on the same are discussed. New corrosion properties for the Mg-Fe-Al system in the low-iron range are presented. Solution potentials of Mg-Fe, Mg-Fe-P, Mg-Fe-Al, Mg-Fe-Al-P alloys in 3% NaCl were determined. The corrosion resistance of Mg-Fe-Si, Mg-Fe-Cl, Mg-Fe-C, Mg-Fe-S, and Mg-S alloys upon exposure to a combination humidity and condensation test was also investigated to a limited extent. (auth)

1991

North American Aviation, Inc.

REDUCTION IN SIZE OF IRIDIUM AND IRIDIUM-RHODIUM ALLOY WIRES BY ELECTROLYSIS, by C. T. Young. Issued Dec. 8, 1952. 12p. (NAA-SR-199)

A procedure is described for preparing short lengths, about $1\frac{1}{2}$ inches, of uniform-diameter wire (about 0.010 in.) from commercially available rods of iridium and alloy of 50% Ir-50% Rh. The procedure utilizes electrolysis in fused mixtures of alkali nitrates and nitrites, with additions of alkali hydroxide. Some early, unsuccessful attempts at achieving wire reduction are reviewed. (auth)

1992

Institute of Engineering Research, Univ. of Calif., Berkeley

THE EFFECT OF DISPERSIONS ON THE CREEP PROPERTIES OF ALUMINUM-COPPER ALLOYS; TWENTY SECOND TECHNICAL REPORT, by Warren H. Giedt, Oleg D. Sherby, and John E. Dorn. Dec. 1, 1952. 23p. (NP-4302; U-23892)

The creep properties of Al-Cu alloys containing dispersions of $CuAl_2$ in the α solid-solution matrix of Al were primarily dependent on the volumetric mean free path between the $CuAl_2$ particles and independent of minor variations in composition (3 to 5% Cu) and heat treatment. The creep stress correlated with the creep rate-temperature parameter $Z = \dot{\epsilon}_s e^{\Delta H/RT}$, where ϵ_s is the secondary creep rate, ΔH the activation energy, R the gas constant, and T the absolute temperature during creep. Above ln Z = 46 and below ln Z = 27.5, the finer dispersions exhibited superior creep resistance; in the intervening range, the coarser dispersions were superior. $CuAl_2$ dispersions increased the Al creep resistance above that obtained by alloying with Cu. ΔH was a constant of about 37,000 cal/mole. Constant-load creep strains for dispersion alloys appeared to be functions of the initial stress and the temperature-compensated time, analogous to the creep behavior of α solid solutions. (cf. TIP U24757) (TID-LC)

1993

New York Univ.

FINAL REPORT [ON] THE QUENCH HARDENING OF TITANIUM-MANGANESE ALLOYS, by Y. C. Liu and H. Margolin. Sept. 15, 1952. 24p. (NP-4313; WAL-401/88-17; U-25922)

Investigation of the microstructure of the Ti-Mn system for compositions having between 3 and 10 wt.% Mn showed that about 5.5 to 6 wt.% Mn was required to stabilize the β phase completely, upon water quenching to room temperature from 1200°C. A martensitic type of decomposition of high-temperature β phase to a stressed α structure occurred in the 4.35 to 5.25 wt.% Mn range. The finding of 2 habit

planes with Miller indexes close to the {334} and {344} poles was not attributed to the difference in composition of platelets with these habit planes. The mid-rib structure, characteristic of martensitic structure in steel, was not found in the Ti-Mn system. The crystal structure of the martensite was hexagonal close-packed with a c/a ratio close to 1.58. Diffuse lines in the back-reflection region were attributed to stresses developed during the martensite formation rather than to methods of specimen preparation. (TID-LC)

1994

Cryogenic Lab., Ohio State Univ.

TECHNICAL REPORT NO. 102-AC49/2-100-2 [ON] THERMAL, STRUCTURAL, ELECTRICAL, MAGNETIC AND OTHER PHYSICAL PROPERTIES OF TITANIUM, ZIRCONIUM, HAFNIUM AND THORIUM AND SOME OF THEIR SIMPLE COMPOUNDS. II. ZIRCONIUM, ITS HYDRIDES, OXIDES, HALIDES, NITRIDE, CARBIDE, AND THE ALKALINE EARTH ZIRCONATES, by G. B. Skinner, C. W. Beckett, and H. L. Johnston. Feb. 1, 1950. 74p. (NP-4342; ATI-81815; Tech. Report No. 102-AC49/2-100-2)

The literature on the preparation and properties of Zr, its hydrides, oxides, halides, nitride, and carbide, and the alkaline earth zirconates, has been reviewed. Information has been reported on methods of preparation, crystal structure, density, transitions between forms, thermal functions, heat of formation, thermal expansion, electrical resistance, and other properties. Although, in many instances, the information is incomplete or unreliable, an attempt has been made to correlate and evaluate the data of the different experimenters. A bibliography of about 300 references has been included. (auth)

1995

Bureau of Mines, College Park, Md.

INTERIM TECHNICAL REPORT ON EFFECT OF ATMOSPHERIC CONTAMINANTS ON ARC WELDS IN TITANIUM [FOR] JULY 1 TO DECEMBER 31, 1952, by J. C. Barrett, I. R. Lane, Jr., and R. W. Huber. [nd] 38p. (NP-4361; WAL 401/155-1)

Arc butt welds were made in $\frac{1}{4}$-in. Ti sheet within a steel welding chamber capable of being evacuated and backfilled with a desired atmosphere. An atmosphere of pure He was used for the control welds; other atmospheres included O_2-He, N_2-He, H_2-He, and water vapor–He mixtures. Both hand and automatic welds were made. The welded specimens were evaluated by hardness, tensile, and bend tests, and by microstructural analysis. It was found that He atmospheres containing as little as 1% O_2 or 1% N_2 caused welds made in them to be seriously embrittled. An atmosphere of He of 5% relative humidity also caused some embrittlement. H_2-He mixtures did not cause as much lowering of ductility as did the other gaseous mixtures; properties of welds in a He atmosphere containing 1% H_2 were nearly as high as those of welds made in a pure He atmosphere. Of the properties evaluated, bend properties and weld hardness proved to be the most sensitive. (auth)

1996

Battelle Memorial Inst.

THE EFFECT OF HYDROGEN ON THE MECHANICAL PROPERTIES OF TITANIUM, by G. A. Lenning, C. M. Craighead, and R. I. Jaffee. July 31, 1952. 64p. (NP-4367)

This report covers the effect of H on tensile and impact properties, the constitution, and the density of high-purity iodide Ti. The solubility of the hydride phase in alpha Ti was investigated, and the solvus line of the high-purity base alloys is presented. Preliminary data are given on the effect of H on the tensile and impact properties, and on the microstructure of commercially pure Ti. (auth)

1997

Metallurgical Advisory Committee on Titanium

STATUS BULLETIN ON UNCLASSIFIED TITANIUM RESEARCH AND DEVELOPMENT OF ARMY ORDNANCE CORPS. Stanley Abkowitz, ed. Nov. 1952. 63p. (NP-4373; Status Bull. P7)

Progress is reported on the following Ti research: reduction and chemical thermodynamics, casting, hot and cold shaping, joining, machining and grinding, surface protection and behavior of surfaces, alloying and heat treatment, and plastic deformation and fracture. (L.T.W.)

1998

ELECTRON-MICROSCOPIC INVESTIGATION OF THE SURFACE OF STRETCHED PURE ALUMINUM. II AND III. Heinz Wilsdorf and Doris Kuhlmann-Wilsdorf. Z. angew. Physik 4, 409-24(1952) Nov. (In German; cf. NSA 7-1130)

Methods for measuring the thickness and slip of the lamella in glide bands are discussed. The mean slip per glide lamella could be determined in all cases to less than 1200 A. A dependence of the mean lamella thickness on the angle between the glide plane and the surface or on the angle between the glide direction and the direction of the glide lines was discovered. Results of all three parts of the work are collectively summarized. 46 figures. (auth)

1999

DEFORMATION BY REPEATED SHOCKS OF SINGLE CRYSTALS OF ALUMINUM-COPPER. Yves Pironneau. Compt. rend. 236, 46-8(1953) Jan. 5. (In French)

A testing devise subjected monocrystalline Al–4% Cu samples to very sudden traction. Velocity at the moment of shock could reach 33 m/sec. Elongation of the sample was proportional to the number of shocks, and thus to the absorbed energy, as in a series of successive plastic flows. (tr-auth)

2000

CREEP AT 250° AND 300°C. OF SOME MAGNESIUM ALLOYS CONTAINING CERIUM. G. A. Mellor and R. W. Ridley. J. Inst. Metals 81, 245-53(1953) Jan.

Following on an investigation (J. Inst. Metals 75, 679(1949)) of the creep strength of Mg-Ce alloys at 200°C, tests have now been made at 250, 300, and 316°C, with and without addition of a third element. At 250°C slight benefit results from additions of Si and Zr; Ag, Li, Zn, and Co have little influence on creep behavior; and Cd and Al are harmful. The best results at 300 and 316°C were obtained with as-cast alloys containing about 2% Ce or rare earths, and 1% Mn. Both rolled and cast alloys of low Mn content can be improved by heat-treatment, but cast Mg-Ce-Mn alloys remain the most creep-resistant. Examination with the optical and electron microscopes showed improvement in creep resistance to be due mainly to the presence of fine precipitates, Mn apparently restraining the coarsening of the Mg_3Ce particles. (auth)

2001

THE EFFECT OF COLD WORK ON THE MICROSTRUCTURE AND CORROSION-RESISTANCE OF ALUMINIUM–5% MAGNESIUM ALLOYS CONTAINING 0-1% ZINC. P. Brenner and G. J. Metcalfe. J. Inst. Metals 81, 261-8(1953) Jan.

The effects of cold work, of prolonged aging at 70°C, and of additions of up to 1% Zn on the microstructure, corrosion resistance, and stress-corrosion resistance of an Al alloy containing 5% Mg, have been investigated. The presence of Zn has little effect on the mechanical properties, but the alloy containing 1% Zn shows pronounced precipitation after aging at 70°C, and corrosion attack is greater than in the case of the 0 to 0.5% Zn alloys, which show an incomplete grain-boundary network after aging. Small amounts of cold work reduce the corrosion resistance of the alloys appreciably, but heavy cold work both of aged and unaged materials results in a corrosion resistance as high as that of unworked material. The maximum

corrosion attack, at about 30% cold work, is associated with the presence of continuous grain-boundary films formed on aging. Comparable behavior has been found in stress-corrosion tests, the maximum susceptibility to stress-corrosion occurring in material that has been given 30% cold work. Heavy cold work (50% reduction in thickness) produces material of high stress-corrosion resistance. Explanations of the corrosion behavior are given. (auth)

2002

A METHOD OF DETERMINING ORIENTATIONS IN ALUMINIUM SINGLE CRYSTALS AND POLYCRYSTALLINE AGGREGATES. G. E. G. Tucker and P. C. Murphy. J. Inst. Metals 81, 235-44(1953) Jan.

A method is described for constructing (100) pole figures from angular measurements of the etch-pits that are developed in micrographically prepared commercial and super-purity Al. Suitable etching reagents are indicated, and the technique of angular measurement using a metallurgical microscope is discussed in detail. A table of angular values which reduces the calculation necessary in plotting the stereographic projections from the etch-pit data has been constructed, and is reproduced. It has been found that the pole figures prepared by this method agree well with those produced from data obtained by x-ray-diffraction techniques.

2003

USE OF FREE ENERGY DATA IN THE CONSTRUCTION OF PHASE DIAGRAMS. W. J. Knapp. J. Am. Ceram. Soc. 36, 43-7(1953) Feb.

A review is given of the use of free energy-composition curves in binary systems for determining the range of composition over which a phase, or combination of phases, is stable at a specified temperature (at constant pressure). Phase boundaries may be constructed in the usual temperature-composition phase diagram from reference to free energy-composition curves for several temperatures. Examples are given of the construction of phase diagrams for the systems $Ca_2B_2O_5$-$CaSiO_3$ and Al_2O_3-Cr_2O_3. The method described involves an assumption of ideal solution behavior, and is limited in application to systems where ideal solutions are approximated. (auth)

2004

VACUUM TIGHTNESS OF WELDED AND BRAZED ALUMINUM CONTAINERS. Mike A. Miller and Allen S. Russell. Welding J. (N.Y.) 32, 116-18(1953) Feb.

Welded and brazed aluminum containers especially prepared with butt and perpendicular joints were tested for vacuum tightness. The methods of welding and brazing are described. Most of the gas that appeared in the vacuum system during test was evolved from the sorbed film originally on the metal. When the part of this sorbed gas which was condensable at −78°C was removed from the measuring system, the rate of appearance of gas for a properly welded or brazed container of the dimensions used in these tests was less than 2×10^{-5} ml STP/hr. (auth)

2005

PRACTICAL ASPECTS OF WELDING TITANIUM ALLOYS. J. J. Chyle and I. Kutuchief. Welding J. (N.Y.) 32, 65S-73S (1953) Feb.

This investigation using the inert-gas W electrode metal-arc process includes factors and welding procedures such as scarf design, direction of travel (backhand or forehand), selection of He or A gases, and the sequence of layer deposition. Welding in completely controlled inert gas protection, the effect of heat treatment on the mechanical properties, radiographic examination, determination of the mechanical and physical properties of the welds, and chemical analysis of the weld metal and parent stock are also included. (auth)

2006

THE INFLUENCE OF CORROSION ON THE CRACKING OF PRESSURE VESSELS. H. R. Copson. Welding J. (N.Y.) 32, 75S-91S(1953) Feb.

This report is a comprehensive review of corrosion with particular emphasis on stress corrosion and corrosion fatigue. The forms of corrosion briefly discussed are: uniform attack, local attack, galvanic attack, corrosion cracking, corrosion-erosion, and subsurface attack at high temperatures. Ways of detecting and preventing caustic embrittlement are described. Stress-corrosion cracking is discussed for the following: Fe, stainless steel, Cu alloys, Al alloys and Mg alloys. Methods are given for the testing for and prevention of stress-corrosion cracking. The general aspects of corrosion fatigue and methods of identification and protection are discussed. Corrosion fatigue data of several metals and alloys are given. Finally, the effect of stress on general corrosion and the effects of H generated by corrosion are discussed. 101 references. (L.M.T.)

2007

DUCTILE WELDING OF ZIRCONIUM. F. G. Cox. Welding J. (N.Y.) 32, 92S-98S(1953) Feb.

It is established that the conditions necessary for the production of ductile welds in Zr are: (1) for welds in Zr sheet of the order of 0.030 in. or thinner, welds made with direct current are definitely superior to those made with alternating current; (2) in welding Zr sheet in thicknesses up to the order of $\frac{1}{4}$ in., it is necessary to shield the work in a much more exacting manner to exclude all traces of air from the weld zone; (3) to ensure ductile welds in sheets thicker than $\frac{1}{4}$ in., the welds must be made in an atmosphere of pure argon. A most important observation arising from the investigation is that the corrosion-resistance properties of properly made welds are such that they can be expected to outlast the parent sheet under conditions of corrosive attack. (auth)

TRACER APPLICATIONS

2008

Atomic Energy Research Establishment, Harwell, Berks (England)

A NEW EXPERIMENTAL FACTOR LIMITING THE QUANTITATIVE APPLICATION OF EMANATING POWER MEASUREMENTS TO THE STUDY OF DIFFUSION PROBLEMS, by D. J. M. Bevan. July 16, 1952. 19p. (AERE-C/R-988)

Emanating power is defined as the ratio between the number of Rn atoms escaping from a solid in unit time and the total number formed within it in unit time. Any attempt to apply emanating power results quantitatively to diffusion problems requires that the source distribution of the particular emanating isotope used should be uniform and constant. In the majority of experimental work Rn^{220} is used as the diffusing species and Th^{228} the parent atomic type. This decays to Rn^{220} through the intermediate daughter product Ra^{224}. With oxides of the fluorite type and certain other compounds, high-temperature treatment leads to a concentration of Ra^{224} in or near a surface, and consequent deviation from uniformity of the source distribution. This effect is discussed qualitatively in terms of the Shottky-Wagner theory of defective solids. (auth)

PHYSICS

2009

Oak Ridge National Lab.

PHYSICS DIVISION QUARTERLY PROGRESS REPORT FOR

PERIOD ENDING SEPTEMBER 20, 1952. Issued Feb. 12, 1953. 32p. (ORNL-1415)

Investigation of the elastic scattering of 0.8- to 2.4-Mev neutrons from N nuclei by pulse-height analysis indicates pronounced forward scattering. The relative yield of γ rays from the reaction $H^3(p,\gamma)He^4$ was determined from 1 to 5.22 Mev. The threshold of the $Al^{27}(p,n)Si^{27}$ reaction was found to be 5.819 ± 0.010 Mev. Reactions of He^3 with H^3, He^3, and Li^6 were studied. Measurements of γ-ray absorption coefficients and coherent scattering cross sections in NaI are reported. Further work is reported on γ-ray angular correlations in Hf^{181} decay. Neutron paramagnetic scattering from trivalent ions of Nd and Er was measured. Neutron total cross section measurements of Cu and Th show Cu resonances at 720 and 2200 ev and six resonances for Th between 23 and 870 ev. The neutron capture cross sections of Sc and Ac^{227} were found to be 23 ± 1 barns and 500 ± 35 barns, respectively. The positron-induced deviation from coulomb scattering of low-energy protons from light nuclei is discussed. The effect of nonzero orbital moments on magnetic scattering of neutrons for small $(\sin\theta)/\lambda$ was calculated. (See ORNL-1365 for preceding quarterly report.) (L.T.W.)

2010

Technical Information Service, AEC

OUTLINE OF DECLASSIFIED VOLUMES IN THE NATIONAL NUCLEAR ENERGY SERIES. Jan. 1953. 86p. (TID-5103)

A list is compiled of the declassified NNES volumes, both published and projected, giving each Table of Contents and the report numbers corresponding to individual chapters. (L.T.W.)

AEROSOLS

2011

Illinois Univ. Engineering Experiment Station

TECHNICAL REPORT NO. 7 [ON] HOMOPOLAR ELECTRIFICATION OF AEROSOLS, by H. F. Kraemer and W. E. Ranz. Sept. 30, 1952. 54p. (SO-1008; Tech. Report No. 7)

Glycerol aerosol particles of uniform size were charged electrically negative by passing them at a controlled rate through a corona generated between two concentric electrodes. Optimum conditions of design and operation were maintained for uniform charging. Aerosols were produced at a rate of 150 mg/hr with average charges of 50 to 225 electron units per particle, diameters of approximately one μ, and a geometric deviation in charge of 1.2 to 1.4. The experimental data were in agreement with a theoretical analysis of the charging phenomena, namely, with equations derived for predicting the average charge on the particles, the precent precipitation on the electrodes, and the statistical deviation in the charge on the particles. An apparatus was developed for measuring the average charge and deviation in charge on the particles. This device measured the charge in terms of the particle trajectories of an aerosol stream flowing through an electric field. The experimental technique and the theoretical equations developed in this research permit the production of a charged test aerosol with controlled size and electrical properties. (auth)

ASTROPHYSICS

2012

THE PROTON-PROTON REACTION AND ENERGY PRODUCTION IN THE SUN. E. A. Frieman and L. Motz. Phys. Rev. 89, 648-50(1953) Feb. 1.

The p-p capture cross section is recalculated using the recently computed deuteron wave functions of Feshbach and Schwinger and the most recent value of the Fermi G factor. The energy production of the p-p cycle is redetermined and applied to the sun, using the luminosity calculations of Epstein. It is shown that the p-p cycle outweighs the carbon cycle by a considerable factor under the assumed conditions of temperature and density. (auth)

COSMIC RADIATION

2013

ANOMALIES OF THE ABSORPTION CURVE OF COSMIC RADIATION IN LEAD. M. Abd El-Wahab Khalil. Nuovo cimento (9) 9, 1248-9(1952) Dec. (In English)

Using a fourfold-coincidence counter telescope at Alexandria, Egypt, the author has determined the absorption of the vertical cosmic-ray component in Pb. Anomalies corresponding to the second, third, and fourth maxima in the Rossi transition curve were found. These anomalies could be caused by small-angle showers, the coincidence arrangement acting as a special case of Rossi's arrangement for detecting transition showers. (G.Y.)

2014

HIGH ENERGY ELECTRONS PRODUCED IN A THUNDERSTORM. J. Clay, H. F. Jongen, and A. J. J. Aarts. Physica 18, 801-8(1952) Nov.

A number of cases has been observed in which the presence of high-energy electrons of 10^9 ev is directly recorded during thunderstorms. In one instance on May 3, 1952, a 4 to 6% increase above the mean value of the ionization was found in six different recording instruments. In one vessel shielded by 110 cm of Fe no increase was found. Three cases were noticed in 1951, and since May 3, 1952 three more have been detected. No influence was discovered in vessels with 110 cm of Fe shielding. The energies lie below 10^{10} ev. An increased ionization was also found during heavy rainfall. (auth)

2015

SEARCH FOR "T-TRACKS" IN PHOTOGRAPHIC PLATES. Paul H. Barrett, G. Cocconi, and Y. Eisenberg. Phys. Rev. 89, 656(1953) Feb. 1.

Blau and Salant (Phys. Rev. 88, 945(1952); BNL-1263; NSA 6-6693) reported evidence for a type of event in photographic plates which they called a T-track and tentatively interpreted as the break-up of a heavy particle at, or near, the end of its range into two fast, singly charged particles. The present authors scanned 112 cm^2 of 400-μ G5 emulsion exposed vertically for 10 hr at 90,000 ft. The search revealed 2191 stars, with 4246 prongs ending in the emulsion. Of these prongs, 335 had minimum ionizing tracks passing within 5 μ of their ends. It was found that $N_h \simeq N_v = 1.0 \times 10^{-3}\ \mu^{-2}$, where N_v is the number of minimum ionizing tracks crossing unit surfaces vertically and N_h the number of tracks crossing unit surfaces horizontally. The expected number of chance T-tracks within a distance r is $n = 2\pi \times 0.86 \times N_h \times r^2 \times$ No. of track endings observed. From the agreement between the observed and calculated number of tracks crossing within 1μ of the endings it is concluded that no new particle has to be postulated to explain the occurrence of T-tracks observed in the plates. (L.T.W.)

2016

A SEARCH FOR THE PRODUCTION OF PENETRATING SECONDARIES BY μ-MESONS UNDERGROUND. A. Lovati, A. Mura, C. Succi, and G. Tagliaferri. Nuovo cimento (9) 10, 105-7(1953) Jan. 1. (In English)

Evidence for the production of penetrating secondaries by μ mesons has been reexamined. A large cloud chamber was located inside a railway tunnel near Verbania, Italy (200 m elevation, geomagn. lat. 47°7′ N) under ~55 m w.e. of granite rock (mean density 2.6 g/cm^3). The chamber contained nine Pb plates each 18 g/cm^2 thick. With this apparatus ~3900 stereoscopic photographs were taken to date, 3114 of which showed one incoming penetrating particle crossing

the first four lead plates at least. No example of penetrating secondary production was found. A few pairs of associated penetrating particles arising in the Al chamber top or in air gaps were observed, but no evidence for direct production at a rate greater than expected from the low cross sections given by Amaldi, et al. (NSA 7-601). (G.Y.)

2017

ANGULAR DISTRIBUTION OF BLACK AND GRAY PRONGS OF MEDIUM- AND HIGH-ENERGY STARS. G. Belliboni and B. Vitale. Nuovo cimento (9) 10, 72-9(1953) Jan. 1. (In Italian)

The angular distributions and angular correlations of the black tracks ($I/I^0 \geq 4.5$) and gray tracks ($4.5 > I/I^0 \geq 2.0$) are analyzed for 148 nuclear disintegrations of low (500 to 700 Mev) and high (800 to 4000 Mev) energy, observed in Ilford G5 nuclear plates exposed to cosmic radiation. In low-energy stars the following features are noted: the distribution of angles with respect to the vertical is considerably anisotropic even for the low-energy tracks in the stars without a recoil track. The lowest-energy tracks are therefore collimated in a downward direction. In the case of stars with a recoil track, the angular distribution is more isotropic. Moreover, for the stars without a recoil track the angles of 90° between the black tracks are abnormally frequent. Therefore, there seems to be an intrinsic angular correlation, independent of the latter anisotropy. For the high-energy stars, the anisotropy of the angular distribution of the black tracks seems to decrease as the energy of the stars increases; and the I/I^0 spectrum shows a secondary maximum for $4.5 \geq I/I^0 \geq 3.0$. The phenomenological picture observed is discussed in relation to its possible interpretations. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

2018

Atomic Energy Research Establishment, Harwell, Berks (England)

TWIN ACCOMMODATION IN ZINC, by P. L. Pratt and S. F. Pugh. May 7, 1952. 15p. (AERE-M/R-964)

A study of the plastic deformation of single crystals of zinc has been made, using the opaque-stop and x-ray microscopic techniques to examine cleavage faces. By these complementary methods, the stresses arising from the twinning shear are shown to be relieved by accommodation kinking. (auth)

2019

Naval Research Lab.

LATTICE DYNAMICS OF BODY-CENTERED AND FACE-CENTERED CUBIC METALLIC ELEMENTS, by Jules de Launay. Jan. 13, 1953. 30p. (NRL-4083)

The Born-von Kármán lattice dynamics for the body-centered and face-centered cubic monatomic metals are reviewed giving particular attention to the role which the conduction electrons play in thermal vibrations and in velocity of sound measurements. The connection between the dynamic parameters of the lattice theory and the results of velocity of sound measurements is explicitly shown. In studying the contribution of the conduction electrons to the thermal motion, two extreme cases are treated: (1) the electron gas does not partake of the thermal motion appreciably; (2) the electron gas follows the ion motion almost exactly. The gas is assumed to possess a bulk modulus but no shear modulus. The secular equations are given for both cases. The Debye characteristic temperature in the T^3 region of atomic heat is computed analytically for both cases when the departure of the elastic constants from the isotropy condition is not too large. The Cauchy relation and the Fuchs relations are derived as natural consequences of cases (1) and (2), respectively. (TID-LC)

ELECTRICAL DISCHARGE

2020

INVESTIGATIONS IN THE FIELD OF GAS DISCHARGE PHYSICS. R. Seeliger. Z. Naturforsch. a8, 74-9(1953) Jan. (In German)

The author reviews some of his experimental and theoretical work on the positive glow column in O_2, thickness of the cathode dark space in gas mixtures, activated electron emission by probes, diffusion theory of columns with volume recombination, and extension of the theory of probes to electronegative gases. (G.Y.)

ELECTRONS

2021

DETERMINATION OF AN ELECTRON TRAJECTORY BY SUCCESSIVE DERIVATIONS. Émile Durand. Compt. rend. 236, 471-3(1953) Feb. 2. (In French)

A numerical calculation method for electron trajectories is derived. (G.Y.)

2022

EXPERIMENTAL STUDY OF THE ELECTROSTATIC IMMERSION OBJECTIVE WITH PLANE ELECTRODES; EXTRACTIVE FIELD E_0 UNDER FOCUSING CONDITIONS; GEOMETRIC ABERRATIONS OUTSIDE THE AXIS. Albert Septier. Compt. rend. 236, 58-60(1953) Jan. 5. (In French)

Optimum geometric and electric parameters of the immersion objective are evaluated. (G.Y.)

2023

PENDULUM SYSTEM FOR THE ELECTRODYNAMIC MEASUREMENT OF THE FIELD ALONG THE AXIS OF A MAGNETIC ELECTRON LENS. Pierre Durandeau. Compt. rend. 236, 366-8(1953) Jan. 26. (In French)

Measurement of the force exerted on a probe composed of two solenoids wound on the same cylinder and suitably phased, determines, despite the finite diameter of the cylinder, the field along the axis of a strong magnetic electron lens. The system can detect field differences of 3 gauss. The uncertainty is ±0.25%. (tr-auth)

2024

DETERMINATION OF AN ELECTRON TRAJECTORY BY SUCCESSIVE INTEGRATIONS. Émile Durand. Compt. rend. 236, 364-6(1953) Jan. 26. (In French)

A well-known method for integration of linear equations of the second order is presented in a more systematic manner which is better adapted to the study of electron trajectories. (G.Y.)

2025

ELECTROSTATIC LENSES PERMITTING FOCUSING OF VERY HIGH ENERGY PARTICLES; FIELD DISTRIBUTION. Michel Yves Bernard. Compt. rend. 236, 185-7(1953) Jan. 12. (In French)

The distribution of electric fields in a new system of electrodes permitting focusing of particles of several megavolts with the aid of very-low-voltage sources has been studied. This type of lens should find application in linear ion accelerators, where the h-f accelerating fields have a defocusing effect which it is desirable to combat. (tr-auth)

GASES

2026

California Inst. of Tech.

THERMODYNAMIC FUNCTIONS OF POLYELECTRONIC ATOMS AT VERY HIGH TEMPERATURES (thesis); TECHNICAL REPORT NO. 7, by Robert Vartan Meghreblian. Nov. 1952. 78p. (NP-4209; Technical Report No. 7)

A convergent series representation for the internal partition function of polyelectronic atoms is obtained by assuming a covolume equation of state for the gas as previously applied by Fermi and Urey to the H atom. The present investi-

gation is limited to those cases wherein only extranuclear electronic excitation occurs. The contribution of these electronic states to the thermodynamic functions is obtained from an acceptable approximation to the sum of the convergent series for the partition function. It is shown that at relatively low temperatures (3000°K), the customary method of evaluating the internal partition function (based on the assumption of an ideal gas) agrees to within a few per cent with the results obtained from the covolume treatment. However, at higher temperatures the increase in size of the excited atoms, along with the appearance of charged particles produced by ionization, renders the ideal gas treatment inadequate. Since the interaction potentials of charged particles are not known in general, an approximate procedure, which neglects these interactions, is suggested for analyzing a system wherein ions and free electrons constitute a small fraction of the total population. This procedure should be useful for treating gaseous mixtures to temperatures of about 10,000°K. (auth)

2027

THEORY OF THERMAL CONDUCTIVITY OF GASES. Josef Meixner. Z. Naturforsch. a8, 69-73(1953) Jan. (In German)

Eucken's equation for the thermal conductivity of polyatomic gases, in the form given by Chapman and Cowling (Mathematical Theory of Non-Uniform Gases, Cambridge, 1939) on one hand and Schaefer (Z. physik. Chem. B53, 149 (1943)) on the other, is derived by the methods of thermodynamics of irreversible processes. Consideration of the reciprocal diffusion of molecules in the different excited states is essential for this. Coefficients of the modified Eucken equation have a clear meaning only for simple cases. (tr-auth)

INSTRUMENTS

2028

Atomic Energy Research Establishment, Harwell, Berks (England)

A FAST COINCIDENCE CIRCUIT FOR EXPERIMENTS WITH HIGH ENERGY PARTICLES, by J. M. Dickson, D. C. Salter, O. Gunnill, P. Dolley, and J. M. Cassels. Oct. 14, 1952. 8p. (AERE-G/R-1039)

A simple, fast, double coincidence circuit is described. It has been tested both with artificial pulses and with pulses produced by 147-Mev protons from the Harwell cyclotron. Resolving times of the order of 5×10^{-9} sec were comfortably achieved. It is suggested that the circuit could be adapted to record triple coincidences. (auth)

2029

Knolls Atomic Power Lab.

AN APPARATUS FOR THE STUDY OF THE EFFECTS OF CYCLIC THERMAL STRESSES ON DUCTILE METALS, by L. F. Coffin, Jr., and R. P. Wesley. Oct. 27, 1952. 47p. (KAPL-830)

Test apparatus developed for the study of thermal stresses is described. Essentially, the apparatus subjects a tubular test specimen of a structural material to a one-dimensional constraint. By subjecting the specimen to cyclic temperatures, an alternating uniaxial stress is developed which will produce a fatigue failure in the specimen after a sufficient number of stress cycles. The device has considerable flexibility in adjustment of temperatures of cycling and frequency of oscillation. A control system permits the cycle to continue automatically to failure of the specimen. Modification of the apparatus permits the strain cycling of test specimens at constant temperature. The apparatus has the advantage of subjecting materials to a simple stress system which can be measured directly. It is possible to separate out elastic and inelastic strains and to study the effect of strain hardening with cycling. Effects of prestraining and stress concentrations can be investigated readily. Attention has been given to temperature distribution in the specimen; all other possible stresses which may arise are found to be secondary in effect. Randomness in fracture location substantiates this. (auth)

2030

Oak Ridge National Lab.

PRECISION SINGLE-CHANNEL ANALYZER; MODEL NO. 5-Q-1192, by J. E. Francis and P. R. Bell. Issued Feb. 10, 1953. 13p. (ORNL-1470)

A new analyzer has been designed to measure the energy spectrum from scintillation counters. It gives an output pulse when, and only when, the input pulse amplitude is between E and E + ΔE. The "window width" (ΔE) is constant within ±1% for all values of E between zero and eighty volts. Any value of "window width" between zero and five volts can be obtained. It has the advantages of working on faster pulses and using fewer tubes than the preceding model. (auth)

2031

SHAPED SOURCES FOR TELETHERAPY UNITS. Marshall Brucer, William G. Pollard, Harry Leiter, and Herbert Scarf. Nucleonics 11, No. 2, 38-41(1953) Feb.

A limiting factor in designing teletherapy units with radioisotope sources is the attainable volume specific activity. The idea of distorting teletherapy-source shapes to give a greater surface area per unit volume is discussed and shown to be impractical. A disk-shaped source offers the greatest efficiency. (L.T.W.)

2032

APPLICATIONS OF KICKSORTERS. G. W. Hutchinson. Nucleonics 11, No. 2, 24-7(1953) Feb.

Pulse-height analyzers, or kicksorters, in conjunction with a detector provide a straightforward means for measuring particle energies. The different types of analyzers are described, and application of pulse-height analysis to coincidence counting is discussed. (L.T.W.)

2033

A SCINTILLATION-COUNTER POWER SUPPLY OFFERING LONG-TIME STABILITY. Albert B. Sperry. Nucleonics 11, No. 2, 61-3(1953) Feb.

To obtain statistically valid results at low counting rates, scintillation counters must be operated in the region where sensitivity is greatly dependent on dynode voltage. In the unit described, the net change in high voltage is limited to 0.077% in 22 hr. Long-term stability was proved by operation for one yr. Tap-switch settings reproduce the required high-voltage and discriminator level for a specific use. High detection accuracy was maintained in low-level biological work, such as brain-tumor detection and thyroid uptake measurements. (L.T.W.)

2034

DEVICE FOR MEASUREMENT OF THE HEAVY WATER LEVEL IN THE SACLAY REACTOR; GENERALIZATION TO MEASUREMENT OF LIQUID LEVELS AND METAL THICKNESSES. J. Weill and M. Brière. J. phys. radium 14, 46-9(1953) Jan. (In French)

An apparatus for measuring and recording liquid levels that may vary by several meters is described. Attainable precision is several tenths of a millimeter. The apparatus is completely automatic. A plumb-bob on an Invar wire is raised or lowered by a motor-driven drum as the bob electrically contacts or breaks contact with the water surface. The rotational position of the drum thus gives a measure of the liquid level. (G.Y.)

2035

INFLUENCE OF ELECTRIC FIELDS ON LUMINESCENCE. Frank Matossi and Sol Nudelman. Phys. Rev. 89, 660-1 (1953) Feb. 1.

Destriau (Phil. Mag. 38, 880(1947)) reported an extinguishing effect of electric fields on phosphors excited by x rays. The present authors have obtained more detailed information about the light output from a near-ultraviolet-excited ZnS-Cu phosphor. A Cu electrode was plated on a 0.2-mm-thick film of the phosphor. A photomultiplier responded to the light output from the phosphor excited by a near-ultraviolet source. The multiplier output was fed into an amplifier and then to the vertical plates of a cathode-ray oscilloscope. A trace of the oscilloscope signal when a 400-v potential and a frequency of 10,000 cps is applied across the film is shown. Application of a d-c field yields a momentary illumination of short duration ($\sim 10^{-4}$sec), with another illumination of reduced amplitude being obtained when the field is removed. (L.T.W.)

2036

A CHARGING DEVICE FOR POCKET ELECTROMETERS. W. H. Sutherland and R. G. Wood. J. Sci. Instruments 29, 267-8(1952) Aug.

A compact and everlasting unit of the Zamboni-pile type for charging pen-type pocket electrometers and ionization chambers is described. The required charging potential is obtained by shortening the pile to a length of ~6cm. The shortened pile is mounted inside a brass tube to which one end of the pile is connected. The top of the brass tube is closed with an ebonite plug into which a brass socket is inserted. This contains a spring-loaded pin which makes contact with the insulated electrode of an electrometer inserted in the socket. The pin is supported by a Perspex disk and a connector is taken from it through a high resistance to the high-voltage end of the pile. The resistor consists of a half turn of thread wound on a Perspex cylinder and covered with Perspex cement. (L.T.W.)

2037

A SINGLE-CHANNEL PULSE-HEIGHT DISCRIMINATOR OF HIGH SPEED AND STABILITY. G. T. Wright. J. Sci. Instruments 29, 157-60(1952) May.

Discrimination between voltage pulses of different magnitudes is effected by simultaneously applying each pulse and its differential to the X and Y deflecting plates respectively of an oscilloscope and by scanning the screen in the X direction with a thin optical slit and a photomultiplier. The pulse height distribution is displayed on a second oscilloscope and recorded photographically. The apparatus is free from zero drift and drift of channel width. The maximum counting rate for regularly occurring pulses is 3×10^5 per sec. (auth)

2038

A FAST AMPLITUDE DISCRIMINATOR AND SCALE-OF-TEN COUNTING UNIT FOR NUCLEAR WORK. F. H. Wells. J. Sci. Instruments 29, 111-15(1952) Apr.

This instrument can accept randomly spaced pulses up to a rate of 10^6 per second and has a dead time of 0.25 ± 0.05 μsec after each recorded pulse. The scaling circuit, which is fully described, uses the technique of step charging a capacitor from the discriminator output pulses. A new locking circuit is used for removing the effects of charge leakage from the condenser. (auth)

ISOTOPES

2039

LOW-ENERGY GAMMA-RAY SOURCES. R. West. Nucleonics 11, No. 2, 20-3(1953) Feb.

The low-energy γ sources Tm^{170}, Am^{241}, Eu^{155}, and Xe^{133} were studied with regard to their application to industry, medicine, and research. (21 references) (L.T.W.)

2040

VARIATIONS IN ISOTOPIC ABUNDANCE OF STRONTIUM. L. T. Aldrich, L. F. Herzog, W. K. Hol[illegible] B. Whiting, and L. H. Ahrens. Phys. Rev. 89, 631-2(1953) Feb. 1.

Isotopic abundances of mineral sources of Sr have been measured. Variations in the ratio Sr^{86}/Sr^{88} of unknown origin have been found from 0.1160 to 0.1220. In Rb-free minerals, the variation of the ratio Sr^{87}/Sr^{88} (0.0832 to 0.0868) is small enough to be completely attributable to the decay of Rb^{87} in geologic time. The large Sr^{87}/Sr^{88} variation in Rb minerals (biotite) from 0.0840 to 0.2629 indicates their suitability for use in the determination of mineral age. (auth)

2041

PUNCHED-CARD CLASSIFICATION OF THE NUCLIDES. J. J. Bonino and K. M. Laing. Nucleonics 11, No. 2, 68(1953) Feb.

The nuclear data are coded into the edges of McBee cards by selectively slotting between the hole and the edge, or between holes of a double row. A desired card or series of cards can be selected from the pack by use of a long needle which penetrates the aligned holes; lifting the needle allows the notched cards to drop free. One set of holes carries the alphabet, so that the symbols of the elements can be coded. The atomic number and the mass number are coded in a series of fields, one for each digit. Thus the card for a nuclide with known mass or number can be found in the randomly ordered pack of cards. The energies and half lives of the various emissions are also coded. (L.T.W.)

ISOTOPE SEPARATION

2042

ELECTROMAGNETIC SEPARATOR FOR ISOTOPES OF LIGHT AND MEDIUM ELEMENTS. René Bernas. J. phys. radium 14, 34-42(1953) Jan. (In French)

An isotope separator with a 60° magnetic sector is described which permits, owing to a procedure for neutralization of space charge, effective use of intense beams of ions. The ion source for solids essentially comprises a hot cathode discharge in a magnetic field and furnishes a focused ion beam of over 10 ma. Results of the first separations (Zn, Sb, and Hg) indicate that isotopes of various elements can be obtained in quantities from 10 to 100 mg/24 hr. (tr-auth)

2043

RESEARCH ON THERMODIFFUSION IN THE LIQUID PHASE; THERMODIFFUSION IN HEAVY WATER. I. Prigogine, L. De Brouckère, and R. Buess. Physica 18, 915-20(1952) Nov. (In French)

Experiments on thermodiffusion of mixtures of heavy and light water are described. The Soret coefficient D'/D is found to be independent of composition. Its value $7 \pm 3 \times 10^{-5}$ $temp^{-1}$ is discussed in connection with the kinetic theory developed in a previous paper of this series. (auth)

MASS SPECTROGRAPHY

2044

A PRACTICAL METHOD FOR CORRECTION OF ANGULAR ABERRATION IN MASS SPECTROMETRY. Ch. Cassignol. J. phys. radium 14, 31-4(1953) Jan. (In French)

A mass spectrometer is described in which the correction for angular aberration has been achieved by an empirical procedure inspired by Foucault's method. The method is compared with the determination by calculation. (tr-auth)

2045

THE Zr^{92}-Mo^{92} AND Zr^{94}-Mo^{94} PAIRS AND THE Zr^{96}-Mo^{96}-Ru^{96} TRIPLET. James S. Geiger, Benjamin G. Hogg, Henry E. Duckworth, and John W. Dewdney. Phys. Rev. 89, 621-3 (1953) Feb. 1.

Mass spectrographic measurements are reported of the following mass differences; $\frac{1}{2}W^{184}$-Zr^{92}, $\frac{1}{2}W^{184}$-Mo^{92}, $\frac{1}{2}Os^{188}$-Zr^{94}, $\frac{1}{2}Os^{188}$-Mo^{94}, $\frac{1}{2}Os^{192}$-Zr^{96}, $\frac{1}{2}Os^{192}$-Mo^{96} and $\frac{1}{2}Os^{192}$-

Ru^{96}. These results are used to check and supplement existing transmutation and disintegration data in the region of the Zr^{92}-Mo^{92} and Zr^{94}-Mo^{94} isobaric pairs and the Zr^{96}-Mo^{96}-Ru^{96} isobaric triplet. 23 references. (auth)

2046

CONSTRUCTION OF A MATTAUCH-TYPE MASS SPECTROGRAPH OF HIGH RESOLVING POWER. J. M. Delfosse and M. Neve de Mevergnie. Ann. soc. sci. Bruxelles Sér. I. 66, 156-61(1952) Dec. 31. (In French)

A double-focusing mass spectrograph has been constructed and is described. Preliminary measurements indicate a resolving power of 12,000. (tr-auth)

2047

IONIZATION PROBABILITY CURVES FOR KRYPTON AND XENON NEAR THRESHOLD. R. E. Fox, W. M. Hickam, and T. Kjeldaas, Jr. Phys. Rev. 89, 555-8(1953) Feb. 1.

The shapes of the ionization probability curves of krypton and xenon have been determined near the ionization potential by measuring the ionization produced by nearly monoenergetic electrons in a mass spectrometer. Ionization processes associated with the $^2P_{1/2}$ and $^2P_{3/2}$ ground states of the ions are clearly resolved. Ions are observed which are attributed to auto-ionization of atoms excited to the higher states having the $^2P_{1/2}$ core configuration. (auth)

2048

MEASUREMENT OF DEUTERIUM OXIDE CONCENTRATION IN WATER SAMPLES BY THE MASS SPECTROMETER. H. W. Washburn, C. E. Berry, and L. G. Hall. Anal. Chem. 25, 130-4(1953) Jan.

Recent improvements in mass spectrometry, allowing samples containing water to be handled satisfactorily, have pointed out the possibility of direct measurement of D concentration in water without the necessity of converting the samples to some other form. In attempting the direct analysis, it was found that relative measurements in the range of normal D concentration (0.015 at.%) could be made with good accuracy, provided that the formation of spurious m/e 19 ions (believed to be H_3O^+) could be reduced. A satisfactory reduction was accomplished by using an ion source in a strong magnetic field with about five times normal voltage applied to the ion-repelling electrode. For samples having D/(H + D) in the vicinity of 0.015 at.%, differences in concentration of 0.0006 at.% were reliably determined. In the range of 3 to 10% differences as small as 0.2 to 0.3% of the D concentration were determined. In samples of nearly pure D oxide, H/(H +D) could be determined within approximately ±0.002 at.%. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

2049

Oak Ridge National Lab.

THE NEUTRON SENSITIVE PCP IONIZATION CHAMBER, by R. K. Abele and J. Gundlach. Issued Sept. 4, 1951. Decl. Dec. 22, 1952. 15p. (AECD-3494; ORNL-1080)

This manual of operation describes a neutron-sensitive ionization chamber, for reactor instrumentation, which yields a current of 100 μa when in a neutron flux of 2×10^{10} nv. The instrument is $2^{15}/_{16}$ in. in diameter and 33 in. in length. The normally required voltage is +370 v. The instrument may be removed from the operating flux and disassembled immediately without special precautions from radiation. (auth)

2050

Argonne National Lab.

HIGH LEVEL γ-RAY AND NEUTRON DOSIMETRY BY GAS EVOLUTION FROM AQUEOUS SOLUTIONS, by Edwin J. Hart and Sheffield Gordon. July 15, 1952. Decl. Jan. 9, 1953. 15p. (AECD-3496; ANL-4844)

A preliminary series of experiments has been carried out to determine the applicability of aqueous solutions to the measurement of high-level γ-ray and neutron sources and in particular to the radiations in CP-3′. In essence, water is decomposed by these radiations and the hydrogen and oxygen evolved are measured at constant pressure in a gas manometer system. The general conclusion drawn from these studies is that gas evolution measurements from aqueous solutions offer an excellent means for continuous monitoring of γ-ray and neutron fluxes in water-cooled reactors with neutron fluxes in the range from 10^{11} to 10^{15} n/cm^2 sec. (auth)

2051

Argonne National Lab.

NEUTRON FLUX MEASUREMENTS WITH THERMOPILES, by Alwyn C. Lapsley. Jan. 1953. 7p. (AECU-2406; UAC-698)

This report describes a compact neutron thermometer developed jointly by the Brown Instrument Division of the Minneapolis-Honeywell Regulator Co. and Argonne. The neutron sensitive element consists of a standard Brown Radiamatic 10-element thermopile onto which an emulsion of B^{10} has been coated, the thermocouple elements being chromel and constantan. Because of the high neutron capture cross section of B^{10}, resulting temperatures can be easily measured, even with low neutron flux. The sensitivity is a function of the area the B^{10} presents to the flux and rough calculations indicate that at a 10^{12} flux, sensitivity would decrease 1% in 3 yrs. (L.M.T.)

2052

Argonne National Lab.

INSTRUMENT RESEARCH AND DEVELOPMENT DIVISION QUARTERLY REPORT [FOR] SEPTEMBER, OCTOBER, AND NOVEMBER, 1952. Dec. 1952. 28p. (ANL-4944)

Results of an experiment to determine the ionization by Po α particles in the noble gases and in mixtures of them are reported (cf. AECU-2235; NSA 6-6474; Phys. Rev. 88, 417(1952)). The technique of preparing polystyrene scintillators has been investigated in greater detail and the effect of fluor concentration on scintillation efficiency has been studied. Further work on oscilloscope sweep circuits has been confined to hard-tube circuits. The resistance measurements on a polystyrene insulator sample $^1/_8$ in. thick and 3 in. in diameter are reported. A rotating-condenser electrometer has been constructed and tested. (L.M.T.)

2053

National Bureau of Standards

FINAL REPORT ON THE RAYDOS DOSIMETER, by Margarete Ehrlich. Jan. 20, 1952. 8p. (NBS-1409)

The Raydos badge is a photographic dosimeter whose radiation-sensitive element consists of commercially available Kodabromide paper, a strip of which is pasted on a piece of cardboard between two printed density-step wedges. The cardboard tab is contained in a moisture-proof envelope of Al foil which has a protective plastic coating. Characteristic curves obtained with Co^{60} γ radiation and 0.6-Mev x radiation are shown. The respective densities obtained at exposures to 200 r at 0.08, 0.2, 0.6, and 1.2 Mev and the percent error in dose interpretation resulting from the dosimeter's energy dependence, referred to an interpretation on the 0.6-Mev curve, are shown. (L.T.W.)

2054

Radiation Physics Lab., National Bureau of Standards

CALIBRATION OF LANDSVERK 0.2-R MIDGET FINGER CHAMBER AND LANDSVERK 0.2-R POCKET CHAMBER, by T. P. Loftus. Dec. 22, 1952. 10p. (NBS-2124)

The chambers were calibrated using 36- to 170-kev x rays and Co^{60} γ rays, the applied dosage of the γ rays being established with a cavity chamber originally calibrated against a Ra source. Results show that for radiations normal to the

chamber axes the response of the finger chamber is ~2.6 times as high for 36-kev x radiations as for Co^{60} γ radiations, while the response of the pocket chamber is ~1.3 times as high. The response of a finger chamber was determined for various angles of incident radiation. For 37-kev radiations the response for parallel incident radiation is 0.8 as much as for normal, while the corresponding factor for Co^{60} γ rays is ~0.94. (L.M.T.)

2055

Radiation Physics Lab., National Bureau of Standards
QUARTERLY PROGRESS REPORT ON RADIOLOGICAL INSTRUMENT CALIBRATION FOR THE QUARTER ENDING DECEMBER 31, 1952, by Frank H. Day. [nd] 29p. (NBS-2216)

Evaluation studies of the following instruments are reported: AN/PDR-32 radiac sets; Tracerlab model SU-13 radiac sets; Tracerlab and Westinghouse AN/PDR-18 survey meters; Beckman, Keleket, and Victoreen IM-9()/PD quartz-fiber dosimeters; Chatham Electronics Corp. AN/PDR-17 dosimeters; and Naval Medical Center Research Institute Sievert chambers. In addition, an annotated bibliography is presented covering publications, lectures, reports, and conferences on various radiation-measuring instruments and techniques. (L.M.T.)

2056

Radiation Physics Lab., National Bureau of Standards
REST OF PREPRODUCTION MODELS OF BECKMAN, KELEKET, AND VICTOREEN, IM-9()/PD QUARTZ-FIBER DOSIMETERS, by T. P. Loftus and R. A. Elmendorf. Jan. 1953. 15p. (NBS-2225)

Data are given of the testing of IM-9()/PD quartz-fiber dosimeters manufactured by Beckman, Keleket, and Victoreen instrument companies. Energy dependence tests were determined using both γ rays and x rays. Leakage tests were performed first under a normal condition and later after subjecting the instruments to 2000-r doses for 2 min. Results indicate that the instruments are gradually being improved. (L.M.T.)

2057

[Radiation Physics Lab.,] National Bureau of Standards
IONIZATION CHAMBER RESPONSE AS A FUNCTION OF WALL MATERIAL; SECOND QUARTERLY PROGRESS REPORT COVERING THE PERIOD FROM 1 OCTOBER 1952 TO 31 DECEMBER 1952, by Frank H. Attix. [nd] 24p. (NBS-2239)

The ultimate objective of the program is to study the response of cavity ionization chambers in the 0.04- to 1.5-Mev energy range as a function of wall material for materials of Z from 4 to 82. Preliminary design work on a chamber (termed an extrapolation chamber) is reported, including a workable method for coating thin (0.0015-in.) polyethylene films with C by a vacuum arc to form a collecting electrode and a guard ring for the chamber. (L.M.T.)

2058

Naval Medical Research Inst., Bethesda
A DIRECT READING RATE METER FOR HIGH INTENSITY PENETRATING RADIATION, by J. E. Morgan, F. W. Chambers, Jr., D. T. O'Connor, and J. T. Istock. Naval Medical Research Inst., Bethesda and Naval Ordnance Lab. Oct. 27, 1952. 18p. (NM-006-012.04.57)

Inherent technical difficulties in the measurement of x-ray intensities from 100 to 5000 r/min, at exciting potentials between 400 and 2000 kvp, have been investigated. Extending the ranges of conventional condenser-electrometer dose meters by use of absorbing media not only increases energy dependence, but is also found to cause an apparent displacement in effective geometrical location of the ionization chamber. Condenser chambers for 250, 1000, and 2500 r have proved susceptible to serious errors from dielectric leakage, which increase rapidly with chamber range above 100 r and with radiation energy above 200 kvp. Associated measurements of voltage saturation indicate that no error from this source need be expected for full-scale exposure times exceeding two seconds. A direct-reading circuit has been developed to combine the known wavelength characteristics of "air wall" thimble-type chambers with the linear current response of a portable d'Arsonval galvanometer. A 25-r Victoreen chamber, remotely read through lengths up to 70 feet of polyethylene coaxial cable, shows linear calibration from 35 to 5500 r/min with over-all reproducibility to the order of ±1.5%. Ionization readings correspond, within the accuracy of chamber volume determination, to the definitive value of esu/cc/sec. (auth)

2059

Norman Bridge Lab. of Physics, Calif. Inst. of Tech.
A FINAL REPORT TO THE RESEARCH CORPORATION OF RESEARCH AND DEVELOPMENT [ON] AN AXIAL FOCUSING MAGNETIC BETA-RAY SPECTROMETER OF HIGH LUMINOSITY, RESOLVING POWER AND PRECISION, WITH PROTON-RESONANCE-STABILIZED HOMOGENEOUS FIELD (WITHOUT IRON); COMPRISING THE THEORY, DESIGN, CONSTRUCTION, AND TESTS OF THE NEW INSTRUMENT, by Jesse W. M. DuMond, Louis Bogart, James L. Kohl, David E. Muller, and James R. Wilts. Mar. 1952. 98p. (NP-4261; Special Technical Report No. 16)

A complete description is given of an axial-focusing magnetic β-ray spectrometer with homogeneous field designed according to principles laid out in an analysis given in an earlier paper by DuMond to yield a mathematical optimum of highest luminosity combined with highest energy resolution. A homogeneous magnetic field is set up by water- and oil-cooled ellipsoidal field windings and all ferromagnetic materials are carefully avoided in the vicinity. This field is automatically stabilized against rapid fluctuations by an electronic stabilizer and against slower drift by three proton resonance heads permanently installed to take care of a range of field intensity from 35 to 1200 gauss. An analysis is given of the various influences contributing to the instrumental line breadth and its structure and it is shown in theory that by the use of a source material distributed over the surface of a small convex cone having an appropriately chosen semi-apex angle, it is possible to obtain, for the first time in the history of such instruments, a very sharply defined fiducial feature on the line profile from which the energy of a homogeneous class of β-rays can be inferred with high precision. This theoretical result is completely verified by observed line profiles. (auth)

2060

Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro (Brazil)
ON THE PHOTOSENSITIVITY OF GLASS SELF-QUENCHING GEIGER-MÜLLER COUNTERS WITH EXTERNAL CATHODE, by Helmut Schwarz. Dec. 1952. 9p. (NP-4382; Physics Note No. 7)

Explanation of the photosensitivity of Maze-type counters is attempted. The effect is observed through the occurrence of spurious counts or double pulses in daylight. A photoelectric effect at the inner surface of the glass wall (surface effect) can be distinguished from one within the gas volume (volume effect). The volume effect seems to be connected with electron attachment to O molecules that either were left in the tubes or were created by decomposition of the alcohol vapor. The probability of electron attachment increases considerably if the O enters a metastable state by light absorption. The negative O ions coming into the neighborhood of the central wire, the anode, will lose their electrons in the high electric field, starting a new avalanche

when the real count is almost completely over. The second type of photosensitivity, the surface effect, seems to be connected with the decrease of the work function of the glass by adsorbed gases, e.g., H from the decomposition of the alcohol vapor. The liberation of electrons from the glass surface by photons is thus facilitated. Minimization of the photosensitivity is discussed. (G.Y.)

2061

Naval Radiological Defense Lab.

A PHOTOGRAPHIC METHOD FOR MEASURING THE DISTRIBUTION OF DOSAGE FROM RADIUM NEEDLES AND PLAQUES, by E. Tochilin. Oct. 1, 1952. 19p. (USNRDL-377)

Using Eastman Type M industrial x-ray film, a photographic method of measuring radiation fields surrounding Ra needles was investigated. Results of photographic measurements have been compared with mathematical calculations of γ-radiation fields. The influence of energy dependence and angular dependence of film on the accuracy of photographic measurements is discussed. (auth)

2062

PHOTOMULTIPLIERS PARTICULARLY ADAPTED TO COUNTING OF SCINTILLATIONS. Émile Morilleau, Henri Dormont, and Robert Champeix. Compt. rend. 236, 474-6 (1953) Feb. 2. (In French)

A photomultiplier tube having a $SbCs_3$ photocathode, an electrostatic lens to focus the photoelectrons on a small surface of the first dynode, and solid (i.e., not grilled or pierced) dynodes is described. High signal-noise ratio, low background, constant gain, and high resolving power are claimed. (G.Y.)

2063

INDIRECT AUTORADIOGRAPHY WITH SPARK COUNTERS. Čestmír Jech. Compt. rend. 236, 482-4(1953) Feb. 2. (In French)

Although resolution of details is not high, a Rosenblum-type spark counter can be used to detect rapidly the distribution of weak α sources. A hydrophobic film of polystyrene or plexiglass is first evaporated on the polished cathode face. Water vapor will condense on whichever spots are then touched by the sparks. The resulting drops are sufficiently durable to be observed and photographed. This method avoids certain difficulties inherent in the similar use of photographic film. (G.Y.)

2064

ON THE BREAKDOWN OF GEIGER-MÜLLER COUNTERS AT HIGH OVERVOLTAGES. Hl. De Vries and G. W. Barendsen. Physica 18, 927-32(1952) Nov.

The relation between the length of a counter and the width of its plateau is measured. From the results an explanation is derived for the well-known breakdown of vapor-quenched counters at high overvoltages; probably the disturbing after-discharges are triggered by complex ions or molecules which form in the field-free region around the wire at high overvoltages. (auth)

2065

A CASE OF AGING IN LIQUID SCINTILLATORS. M. Ageno, G. Cortellessa, and R. Querzoli. Nuovo cimento (9) 9, 1242-3(1952) Dec. (In Italian)

Using MsTh (Ra^{228}-Ac^{228}) as a source of γ rays, the authors have determined the curves of fluorescence vs. concentration for freshly prepared naphthalene-xylene solutions and for solutions which had stood for up to 10 months in cork-stoppered glass bottles. Large changes in the shape of the curves, presumably due to chemical alteration, may explain discordant results in the literature (Kallman and Fürst, Phys. Rev. 79, 857(1950); 81, 853(1951); Ciccone, Nuovo cimento 9, 36(1952)). (G.Y.)

2066

THICKNESS OF TRACKS OF HEAVY NUCLEI IN NUCLEAR EMULSIONS. Pierre Cüer and Jean-Pierre Lonchamp. Compt. rend. 236, 70-2(1953) Jan. 5. (In French)

It is shown that the relation of Freier, et al. (Phys. Rev. 74, 1818(1948)), used by experimenters to calculate the charge of a heavy nucleus as a function of the thinning down of its track in nuclear emulsion, is not valid. A mechanism of probable topographic distribution of the latent image which brings in the spatial spectra and density of δ rays explains the facts known to date. Verification has been accomplished with fission tracks. (tr-auth)

2067

DETECTION OF RADIOACTIVE CARBON WITH THE SCINTILLATION METHOD. W. Hanle, K. Hengst, and H. Schneider. Z. Naturforsch. b7, 633-4(1952) Nov. (In German)

Detection of C^{14} with a scintillation technique is described. The provisional sensitivity limit is 10^{-3} mc/mole of CO_2, which can be improved by cooling. The scintillation method is compared with the counting-tube method. (G.Y.)

2068

EXPLOITATION OF ROUGH EXPERIMENTAL RESULTS GIVEN BY THE METHOD OF DELAYED COINCIDENCES. R. Ballini and A. Berthelot. J. phys. radium 14, 1-8(1953) Jan. (In French)

Expressions are given by which the distribution of half lives of short-lived nuclei formed at hazard over a period of time can be determined from delayed coincidences. Counting rate and dead time of the detectors, as well as dead time of the apparatus registering the coincidences, are considered. The only hypotheses made are the following: (1) the detector pulse is produced without delay with respect to emission of the detected particle, and (2) the apparatus possesses a dead time θ such that between the creation of unstable nuclei whose half life is registered there exists a time interval at least equal to θ (the dead times being noncumulative). The calculations are readily applicable to different types of apparatus. (tr-auth)

2069

TRI-α-NAPHTHYLBORINE, A NEW SCINTILLATION MATERIAL FOR THERMAL NEUTRONS. J. J. van Zolingen and J. J. Went. Physica 18, 976-7(1952) Nov.

Scintillation properties of tri-α-naphthylborine, $B(C_{10}H_7)_3$, for the γ and thermal-neutron radiations from a Ra-Be source have been determined. A curve of the ratio between the neutron-counting rate and the γ-counting rate shows a maximum at a certain pulse-discriminator setting. (G.Y.)

2070

BETA SPECTROMETER WITH UNIFORM MAGNETIC FIELD. Pierre Bretonneau and Jean Moreau. J. phys. radium 14, 25-30(1953) Jan. (In French)

The theory of focusing in a uniform field with a point source is presented, and the theory for an extended source is discussed. A β spectrometer is described, and the results of experiments relative to its calibration and resolving power are presented. (tr-auth)

2071

ABSOLUTE BETA COUNTING OF THICK PLANAR SAMPLES. R. G. Baker and L. Katz. Nucleonics 11, No. 2, 14-19(1953) Feb.

On the basis of previous work and new data, several methods are presented for determining disintegration rates of thick β-active samples to better than 20% accuracy. With the equations derived, self-scatter and self-absorption corrections can be made for samples thicker than $\frac{1}{4}$ of the β-ray range. (auth)

2072

A SIMPLIFIED LIQUID-SAMPLE GEIGER COUNTER. J. U. Hidalgo, S. B. Nadler, and R. T. Nieset. Nucleonics 11, No. 2, 66-7(1953) Feb.

A γ-sensitive liquid-sample counter is described. The detecting tube is mounted on a small chassis to which a holder for small test tubes is attached. The holder, built of lucite and brass rods, is designed so that the test tubes are opposite the effective center of the G-M tube. A 5-ml sample containing 0.10 μc of I^{131} yields a counting rate of 9.88 cps with a background of 1.3 cps. (L.T.W.)

2073

TREATMENT OF NUCLEAR EMULSIONS OF 100 TO 1000 μ THICKNESS. Georges Marguin. J. phys. radium 14, 43-6(1953) Jan. (In French)

A method for handling Ilford G5 emulsions is described by which uniform development over the entire thickness is obtained with minimum distortion. (tr-auth)

2074

STUDY OF THE FLUORESCENCE EXCITED BY α RADIATION IN ZINC SULFIDE WITH THE AID OF AN ELECTRON PHOTOMULTIPLIER. Pierre Leuba and Jean-Pierre Anthony. Compt. rend. 236, 374-7(1953) Jan. 26. (In French)

Duration and shape of the voltage pulse from a photomultiplier attached to a scintillator crystal can be calculated, under certain assumptions concerning photomultiplier characteristics, so as to be in excellent agreement with experimental results obtained with a ZnS screen irradiated with Po α particles. (G.Y.)

2075

A CRYSTAL-PHOTOMULTIPLIER GAMMA COUNTER FOR HOSPITAL USE. A. H. Ward and P. G. Jensen. J. Sci. Instruments 29, 181-3(1952) June.

A large versatile γ counter has given satisfactory service for one and a half years. The NaI(Tl) crystal, photomultiplier, and auxilaries are described. It has a high efficiency, about 20% at 1.2 Mev. It has been used for hospital measurements on patients with radioactive contamination, on biological samples, and on experimental animals. (auth)

2076

SOME DISTURBING EFFECTS IN GLASS GEIGER-MÜLLER COUNTERS. L. Carlbom and C. Taylor. J. Sci. Instruments 29, 296(1952) Sept.

Two undesirable effects observed in a glass-enveloped β counter filled with A at 126 mm Hg A and methylal at 14 mm Hg are that 1 to 10 pulses/min occur below the normal starting potential, causing a corresponding increase in the number of background pulses, and that the counter efficiency decreases with time after the high tension has been applied, reaching a constant value after ~2 hr. The spurious pulses were found to be due to discharges between the central wire and the glass screening tubes. The pulses were completely eliminated by fitting the counter with metal end caps painted over with aquadag to increase the leakage between the central wire and the screening tubes. The decrease of counter sensitivity is attributed to a slow rise in the screening-tube potential. This effect has been eliminated by the use of stainless steel for the screening tubes, which are internally connected to the counter wire. (L.T.W.)

2077

A RADIATION MONITOR FOR DEMONSTRATION PURPOSES. K. E. G. Perry and F. S. Goulding. J. Sci. Instruments 29, 243-5(1952) Aug.

A brief description is given of the circuit and layout employed in a radiation monitor intended primarily for demonstration purposes. The instrument is of the standard Geiger counter-counting rate circuit type, attention being concentrated on the provision of clear circuit identification to assist lecturers describing this type of instrument. (auth)

2078

CONSTRUCTION OF MAZE COUNTERS AND THEIR CHARACTERISTICS FROM 0 TO 50°C. R. Favre and Ch. Haenny. Helv. Phys. Acta 26, 53-64(1953) Feb. 15. (In French)

Glass counter tubes with external cathodes, the anode wires of which are connected electrostatically through their fastening in a manner permitting thermal degassing, give parasitic discharges which are suppressed by internal metallization of the corresponding end of the housing. These counters are characterized by identical thresholds and by plateaus of ~300 v, the average slopes of which are 3 and 1.6%, respectively, for anodic resistances of 1 and 20 megohms. The authors give an explanation of the minor variations of the slope observed when the counting rate or temperature changes. After 10^9 counts, the plateaus have shortened almost to disappearance. (tr-auth)

2079

A DEVICE FOR MARKING EVENT POSITIONS ON THE SURFACE OF NUCLEAR EMULSIONS. E. W. Titterton and W. Barneveld. J. Sci. Instruments 29, 250-1(1952) Aug.

A description is given of a device which scribes a circle of chosen diameter on the surface of a nuclear emulsion above a particular event. The circles so marked can be seen with the naked eye in reflected light and greatly facilitate re-examination of an event. (auth)

2080

AN APPARATUS FOR THE MEASUREMENT OF MULTIPLE SCATTERING OF TRACKS IN NUCLEAR EMULSIONS. N.C. Barford and R. M. Tennent. J. Sci. Instruments 29, 217-18 (1952) July.

A projection microscope, modified for measurement of the small-angle-scattering of tracks observed in nuclear emulsions, is described. The apparatus has been used to determine the masses of cosmic-ray particles which come to rest in the emulsion. If single scatters are eliminated, a function of the scattering angle and the range may be found which is independent of energy and has a gaussian distribution. (auth)

2081

DEAD TIME CORRECTION FOR MONITORED COUNTERS. W. H. Hall and G. K. Williamson. J. Sci. Instruments 29, 132(1952) Apr.

In the use of G-M counters it is often necessary to measure a radiation intensity relative to the original intensity of the source rather than to know the counts recorded in a given time. A fraction of the source intensity is fed into another counter which automatically stops counting after it has registered a predetermined number of events. An expression for the dead-time correction for such a count is developed which includes factors for the monitoring and principal counters. (L.T.W.)

2082

FLUORESCENT NONCRYSTALLINE SOLIDS FOR RADIOACTIVITY MEASUREMENTS. L. Pichat, P. Pesteil, and J. Clément. J. chim. phys. 50, 26-41(1953) Jan. (In French)

Properties of some noncrystalline solids useful in scintillation counters are reported. p,p'-Distyrylbenzene and pyrene in solid solution in polystyrene are equivalent as phosphors to 1,1,4,4-tetraphenyl-1,3-butadiene (TPB) in the same solvent or to terphenyl in xylene. The average intensity of scintillations produced in the TPB-base solid solutions is improved by addition of a second solute. The solutions in polystyrene containing 1% stilbene + 1% TPB, or the solutions in a copolymer of 64% α + β vinyltetralin

+ 36% styrene and containing either 1% TPB or 0.5% stilbene + 0.5% TPB are phosphors for which the average intensity of scintillations produced in a given volume by a γ source is about 30 to 40% greater than the average intensity of scintillations produced by the same source in a saturated solution of p-terphenyl in xylene, or 2% of TPB in polystyrene, and equal to about 45% of that furnished by an anthracene crystal. Absorption spectra of the solutes and fluorescence spectra of the "solvents" and "phosphors" are given for a large number of mixtures studied. The luminescence yield is the better the more closely the fluorescence spectrum of the solvent and the absorption spectrum of the solvent and the absorption spectrum of the solute coincide. In the case of solid solutions having two solutes, a double transfer of the energy absorbed by the solvent is indicated. The mechanism of this transfer is discussed. (tr-auth)

2083

WAVELENGTH DEPENDENCE OF THE FLUORESCENCE OF ORGANIC PHOSPHORS IN THE ROENTGEN REGION. Gerhard Breitling. Z. angew. Physik 4, 401-9(1952) Nov. (In German)

The wavelength dependence of fluorescence intensity of various solid and liquid organic phosphors was investigated in the x-ray region (0.078 to 1.78 kX). The results show that x-ray energy transformed into energy of photo- and Compton electrons is effective in the scintillation process and that the fluorescence yield remains practically constant. Calculation of the wavelength dependence of a phosphor of known composition and density is therefore possible. The wavelength dependence of an organic solvent can be determined by dissolving a small quantity of an organic phosphor in the solvent, the energy transfer from the solvent molecules to the phosphor being directly detectable. The reduced efficiency of chlorobenzene solutions with respect to benzene is the result of radiationless energy transfer in the absorbing chlorobenzene molecule. Availability of phosphors of known composition makes the scintillation counter applicable as a dose-measuring instrument. Advantages over the usual methods are discussed. As an example, the measurement of the β and γ dosages from a Au^{198} pellet is reviewed. (tr-auth)

2084

THE APPARENT DEAD TIME OF A GEIGER COUNTER, MEASURING AN INTENSITY OF RADIATION WHICH VARIES PERIODICALLY. H. Daams. Applied Sci. Research (Netherlands) B3, 29-34(1952).

A formula is derived for correcting the effect of the dead time when measuring periodically varying intensities of radiation with a Geiger counter. This formula should also be valid when the period of the variation becomes equal to the dead time of the counter, in which case the apparent dead time is reduced appreciably. An experimental test shows that with increasing frequency of the variation the number of counts indeed goes through a maximum. (auth)

2085

PROPERTIES OF ARGON-BROMINE COUNTERS. D. van Zoonen and G. Prast, Jr. Applied Sci. Research (Netherlands) B3, 1-17(1952).

Argon-bromine counters are compared with argon-alcohol counters. The point is stressed that their properties change when the charge developed in the counter becomes equal to or greater than the charge originally present at the wire. The so-called oscillations are investigated and partially explained as well as the delay in the build-up of a pulse, this delay being dependent on the overvoltage. A clear-cut picture of the mechanism of these counters can not yet be given. (auth)

2086

DRIFT VELOCITY OF ELECTRONS IN BF_3. A. Bracci and E. L. Zimmer. Nuovo cimento (9) 10, 103-4(1953) Jan. 1. (In English)

Measured drift velocities of electrons in BF_3 are plotted as a function of E/p (electric field/pressure) from 1 to 5 v/cm/mm Hg. The values were not influenced by small quantities of impurities in the BF_3. (G.Y.)

MESONS

2087

Rochester Univ.

CHARGE-EXCHANGE SCATTERING OF 40 MEV π MESONS IN HYDROGEN AND DEUTERIUM, by A. Roberts and J. Tinlot. Feb. 3, 1953. 37p. (NYO-3713)

The total cross section for the charge-exchange scattering of π mesons in H and D at 40 Mev has been measured. Both single photons and two-photon coincidences were detected. The results are relatively independent of the assumed angular distribution of the π mesons. A value of 4.7 ± 1.5 mb was obtained for the total charge-exchange cross section of π^- mesons in H. The expected null result was obtained for π^+ mesons in H. In D, values of about one-third the H cross section were obtained for both mesons. The photons observed from C and O do not appear to be mainly from π^0 decay, and the cross section for π^0 production in C and O is less than 5 mb for both mesons. The two-photon coincidences yield a rough value of 0.7 mb/ster for the differential charge-exchange cross section for π^- on H at 90°. The accuracy is sufficient to rule out the possibility of a very deep minimum at 90°, e.g., a $\cos^2 \theta$ angular distribution. (auth)

2088

Radiation Lab., Univ. of Calif., Berkeley

SUMMARY OF RESEARCH PROGRESS MEETING OF NOVEMBER 13, 1952, by Sergey Shewchuck. Dec. 23, 1952. 6p. (UCRL-2064)

Alpha Particle Energy Distributions Following the Decays of B^8 and Li^8. F. C. Gilbert. Be foils were bombarded with 375-Mev particles, and the energy distributions of the α particles from the nuclear processes indicated energy levels in the short-lived Be^8 nucleus at 3 Mev and possibly at 9 Mev. π^- Meson Production by Neutrons on Oxygen. F. C. Ford. Neutron bombardment of O_2 produced one π^- meson to 125 stars and a plus-to-minus ratio of one π^+ to 20 π^-. The star energy ranges were from 0 to 160 Mev with a peak at 28 Mev. The angular distribution varied from 0 to 20°. A distribution curve of number of mesons per unit solid angle vs. the scatter angle revealed a peak at 180°. The maximum neutron energy was 340 Mev, with the bulk around 305 to 310 Mev. (L.T.W.)

2089

MULTIPLE MESON PRODUCTION BY HIGH ENERGY NUCLEON-NUCLEON COLLISIONS. H. Fukuda. Phys. Rev. 89, 842-7(1953) Feb. 15.

A comparison is made between Fermi's theory and Lewis, Oppenheimer, and Wouthuysen's theory of multiple meson production in high-energy nucleon-nucleon collisions, and an analysis is made of some typical examples. The main difference between the two theories concerns the Lorentz covariance of the matrix element which is related, in Fermi's theory, to the Lorentz contraction of the volume in which the thermal equilibrium of virtual mesons is supposed to be established, and to the Lorentz invariant phase volume in L. O. W.'s theory. It is resonable to take the contracted diameter of the volume in Fermi's theory to be of the order of the wavelength of the emitted meson (not that of the incident nucleon), and as a result both theories can

explain to some extent the multiplicity and angular distribution. The main difference lies in the average energy of the emitted mesons in the center-of-mass system as a function of multiplicity. (auth)

2090

SLOW HEAVY MESONS FROM COSMIC RAY STARS. R. Levi Setti and G. Tomasini. Nuovo cimento (9) 9, 1244-7 (1952) Dec. (In English)

Two stars have been observed, in nuclear plates exposed at a maximum altitude of 90,000 ft, showing the ejection of a slow heavy meson, which, after being brought to rest in the emulsion, disintegrates with the emission of one charged secondary particle. The masses of the two heavy mesons were 1040 ± 90 and 1380 ± 210 m_e with respective lives of $>10^{-10}$ and $>5 \times 10^{-11}$ sec. The first event belongs to a $S\kappa$ class, while the second seems to fall into a $S\chi$ class. (G.Y.)

2091

NON-LOCAL THEORY OF NUCLEON-MESON FIELD. N. Shôno. Progress Theoret. Phys. (Japan) 8, 133-4(1952) July.

The pseudovector interaction of nucleons with pseudoscalar mesons appears to be the best description in the theory of nucleon-pion systems, but for this type of interaction the renormalization procedure cannot be applied in the present formalism of the theory, and the perturbation method gives a poor approximation in high-energy regions. Removal of divergences by renormalization requires the introduction of an infinite number of counter interactions of successively higher-order derivatives of field variables. The renormalized interactions can be interpreted as non-local, and the theory of non-local interactions may be translated into the theory of non-local particles. On the assumption that both nucleons and pseudoscalar mesons are non-local particles, it is shown that the S matrix is divergence-free and its perturbation expansion gives a good approximation. (L.T.W.)

2092

AN INTERPRETATION OF THE MESO-DISINTEGRATION OF THE DEUTERON IN TERMS OF THE STRONG COUPLING MESON THEORY. S. Matsuyama and H. Miyazawa. Progress Theoret. Phys. (Japan) 8, 140-1(1952) July.

The results obtained from the pseudoscalar meson theory, with strong coupling, of deuteron meso-disintegration are discussed. The strong coupling theoretical treatment for the two-nucleon system was carried out in the adiabatic approximation. The derived hamiltonian consists of, besides the kinetic energies of two-nucleon and free-meson energy, the nuclear potential and the isobar energies and interactions with unbound mesons of each nucleon. The latter two are modified by the presence of another nucleon in its neighborhood. (L.T.W.)

2093

THE S MATRIX METHOD IN PION REACTIONS. Tadao Nakano and Kazuhiko Nishijima. Progress Theoret. Phys. (Japan) 8, 53-76(1952) July.

A new method which is convenient for the phenomenological analysis of the mutual correlations among various pion reactions is presented, based on the S-matrix formalism. The general properties of the S matrix are studied, and the intimate correlations between the photomeson production and pion-nucleon scattering are discussed. The results give correctly the ratio $\sigma(\pi^+P)/\sigma(\pi^-P) = 3$ (at 130 Mev), which can not be deduced from the lowest-order perturbation theory. The method is applied to the qualitative investigation of the elastic nucleon-nucleon scattering at extremely high energies, from which it can be concluded that the scattered nucleons will be concentrated in the forward and backward directions in the c.m. system. (auth)

2094

THEORY OF THE SUBTRACTIVE FIELD AND THE MASS SPECTRUM OF MESONIC PARTICLES. Charles Martin. Compt. rend. 236, 53-5(1953) Jan. 5. (In French)

The ever increasing number of mesonic particles permits a tentative classification based on theoretical considerations. The series of masses appears to confirm sufficiently well a whole multiplicity of the number 137. The theory of the subtractive field developed by L. de Broglie permits deduction of some interesting numerical consequences of this hypothesis. (tr-auth)

2095

INTERACTION OF μ MESON WITH MATTER. II. SPONTANEOUS DECAY OF NEGATIVE μ MESON. Toshinosuke Muto, Makoto Tanifuji, Kenza Inoue, and Takeo Inoue. Progress Theoret. Phys. (Japan) 8, 13-27(1952) July.

The negative μ-meson decay from the bound state around the nucleus has been worked out. The characteristic differences of the energy spectra of decay electrons and the decay life time of μ^- in comparison with those of μ^+ have been pointed out for a number of mass values of neutral particle ($\mu^0 = 0$, 20m, 40m) and several forms of couplings of the decay process. The possibility of observing characteristics of the negative μ meson is discussed briefly. (auth)

2096

THE INTERNAL PAIR PRODUCTION OF γ-RAYS OF MESONIC ORIGIN; ALTERNATE MODES OF π° DECAY. P. Lindenfeld, A. Sachs, and J. Steinberger. Phys. Rev. 89, 531-7(1953) Feb. 1.

The internal pair creation of the γ rays in the processes $\pi^0 \rightarrow \gamma + \gamma$ and $\pi^- + P \rightarrow \gamma + N$ has been observed. The experimental conversion coefficient $\beta = 0.0080 \pm 0.0016$ is to be compared to the theoretical prediction, 0.0063. In addition, we have obtained an upper limit on the fraction of neutral pions which decay directly into a pair: $\pi^0 \rightarrow e^+ + e^-$. The limit is one in 2000. (auth)

METEOROLOGY

2097

Institute for Atomic Research, Iowa State Coll.

A METHOD FOR THE DETERMINATION OF THE COMPOSITIONS AND TEMPERATURES OF STRATOSPHERIC CLOUDS, by Matthew Parasol. Institute for Atomic Research, Iowa State Coll. and Ames Lab. Dec. 1952. 2p. (ISC-303)

Liquid water at 19°C has a strong infrared absorption band at 3395 cm^{-1} (2.95 μ) with a considerably weaker band at 1646 cm^{-1} (6.1 μ). Ice at 0°C has a band at 3370 cm^{-1} (3.0 μ) while at –180°C the band has shifted to about 3100 cm^{-1} (3.22 μ). These data suggest an experiment for determining the compositions of nacreous and noctilucent clouds. The infrared spectrum of the cloud type in question should be analyzed in the region from 1430 to 5000 cm^{-1} (2 to 7 μ). The presence of the two bands would show whether the material is water, and, if water, the exact location of the bands would show whether it is in the liquid or solid phase. (auth)

2098

WIND PROFILES AND THE SHEARING STRESS. E. L. Deacon and H. A. Panofsky. Quart. J. Roy. Meteorol. Soc. 79, 164-7(1953) Jan.

Agreement of calculated surface-roughness parameters and shearing stress, from measurements of wind velocities at two or more heights, with data taken at Brookhaven and elsewhere is discussed. (G.Y.)

2099

THE VARIATION OF THE TURBULENCE SPECTRUM WITH HEIGHT UNDER SUPERADIABATIC CONDITIONS. H. A.

Panofsky. Quart. J. Roy. Meteorol. Soc. 79, 150-3(1953) Jan.

Measurements were made of turbulent variations of meteorological parameters along the 410-ft tower of the Brookhaven National Laboratory on a typical fair maritime-tropical day, with air blowing onshore from the Atlantic. The wind speed at 410 ft increased during the day from 4 m/sec at 10 EST to 7 m/sec at 14 EST, backing from 220° to 200°. The lapse rate from 37 ft to 410 ft during this period was constant at about 1.5°C/100 m. A crude spectral analysis of vertical kinetic energy, heat flux, and Reynolds stress obtained is presented. It is shown that the relative contribution of high-frequency eddies to the fluxes and energy decreases with height, whereas the relative importance of long-period eddies increases with height. (G.Y.)

MICROWAVES

2100

MICROWAVE RESONANCE ABSORPTION IN GADOLINIUM METAL. A. F. Kip, C. Kittel, A. M. Portis, R. Barton, and F. H. Spedding. Phys. Rev. 89, 518(1953) Jan. 15.

Microwave resonance absorption in pure Gd metal (<0.1% other rare earths) was measured near 9000 and 24,000 Mc in the ferromagnetic regions. It has been suggested that Gd is a good realization of the atomic model of a ferromagnet and the authors wished to determine how closely the g value corresponds to the value for free electron spin. The g factor obtained in the paramagnetic region is 1.95 ± 0.03. The extreme breadth of the absorption curve in the ferromagnetic region prevents accurate determination of its g value, but calculations indicate a value of ~1.94. From the results it is suggested that spin-orbit coupling effects, possibly between the spin of $4f^7$ shell and the orbit of the 5d electron spoil the purity of the assumed ^8S ionic state. (L.M.T.)

NEUTRONS

2101

[Los Alamos Scientific Lab.]

METHODS OF TREATMENT OF DISPLACEMENT INTEGRAL EQUATIONS, by S. Frankel and E. Nelson. [nd] 94p. (AECD-3497; LADC-79)

The various methods which have been used in the treatment of problems in the theory of neutron diffusion which are representable in terms of integral equations are discussed in great detail. These problems are primarily those involving the determination of critical sizes and multiplication rates for various configurations of active and tamping materials. A simple albedo problem is also discussed. A number of graphs have been prepared giving the mathematical data involved in the solutions of these problems and many of the solutions themselves. (auth)

2102

NOTES ON THE DECAY OF THE NEUTRON. II. Tsuneyuki Kotani, Hisao Takebe, Minoru Umezawa, and Yoshio Yamaguchi. Progress Theoret. Phys. (Japan) 8, 120-32(1952) July.

Theoretical predictions derived in the preceding part of this series (Progress Theoret. Phys. (Japan) 7, 469-80(1952); NSA 7-1214) concerning electron-proton angular correlations and proton momentum spectrum are summarized, and the results are discussed. Expressions for angular correlations and proton spectra are derived for several cases, and the linear combination of 5 types of interactions is shown. (L.T.W.)

2103

ARTIFICIAL SYNTHESIS OF THE NEUTRON AND ITS FUTURE. R. d'Aubry de Puymorin. Euclides (Madrid) 12, 411-13(1952) Oct. (In French)

Since the neutron is known to be β radioactive with a maximum energy of 782 kev, the possibility of the reverse of this process, the synthesis of a neutron, may be considered. The author suggests that certain observations by J. J. Thompson on electrodeless discharge in gases and recent conclusions by Rayleigh (Proc. Roy. Soc. (London) A189, 1018(1947)) that the energy available in electrical discharge is sometimes of higher than chemical order may have been the result of endothermic synthesis of neutrons and their subsequent decay. (G.Y.)

NUCLEAR PHYSICS

2104

ENERGY IN THE NUCLEAR FIELD. E. M. Williamson. Nuovo cimento (9) 10, 113-26(1953) Feb. 1. (In English)

The various types of nuclear fields may be described by tensors of suitable rank in a five-dimensional continuum which satisfy field equations whose form is suggested by electromagnetic theory. The five-dimensional notation suggests the adoption of a generalized energy tensor which is found to consist of terms usually introduced separately as field energy and interaction energy, respectively. It follows from the nuclear field equations that the total energy is now finite. An alternative expression for the interaction energy is obtained from the fundamental equation of the nucleon in the presence of the nuclear field. This contains terms involving the field tensors which indicate an additional amount of energy. Comparison of this expression with that part of the total energy which is considered to be interaction energy identifies the polarization tensors associated with the nucleon. The interaction energies are calculated for the two-nucleon problem and found to be of the usually accepted type. The new suggestion, however, is that any infinite terms which arise are balanced by corresponding terms in the field energy. Although this has previously been pointed out in a simple case, the present paper shows that this property is shared by all types of nuclear fields. The results are finally expressed in the usual four-dimensional notation, but the five-dimensional approach introduces a coherence into the treatment of the problem, as Klein has shown it does in other branches of physics. (auth)

2105

LIQUID DROP BEHAVIOUR OF AN INDEPENDENT PARTICLE NUCLEAR MODEL. S. Gallone and C. Salvetti. Nuovo cimento (9) 10, 145-50(1953) Feb. 1. (In English)

The behavior of a particular independent-particle nuclear model has been studied in order to investigate the nature of the asymmetric models. It is shown that the asymmetry is not strictly related to the assumption of a Rainwater-type model. Moreover, analogies in the behavior of the shell and liquid-drop models are indicated, and a limitation to the liquid-drop description is shown. (auth)

2106

DEVIATIONS FROM LS COUPLING IN THE SPHEROIDAL CORE NUCLEAR MODEL. J. P. Davidson and E. Feenberg. Phys. Rev. 89, 856-63(1953) Feb. 15.

Deviations of measured magnetic moments from the Schmidt limits have been interpreted in terms of a failure of LS coupling. The model of an odd nucleon coupled to a nonspherical core provides an unforced theoretical basis for this interpretation. Projection operators for pure LS coupling states are introduced and applied to compute the statistical weights of the $L = I - \frac{1}{2}$ and $L' = I + \frac{1}{2}$ components in Bohr's strong coupling wave function. The orbital gyromagnetic ratio of each component is also determined. Numerical results on the energy displacements produced by the coupling of the odd nucleon to the distorted core are generally unfavorable to the strong coupling description. A perturbation method appropriate to a weak coupling description is more likely to provide a satisfactory solution of the dynamical problem. (auth)

2107

THE DYNAMICAL THEORY OF NUCLEAR INDUCTION. R. K. Wangsness and F. Bloch. Phys. Rev. 89, 728-39 (1953) Feb. 15.

Starting from the microscopic viewpoint, the dynamics of nuclear induction is derived by means of statistical methods. The only essential lack of generality lies in the assumption that the nuclei in the sample are independent of each other, so that the treatment does not account for features arising from spin-spin interaction. By considering the simultaneous action of an arbitrary external field and of the molecular surroundings upon a representative nucleus a system of linear differential equations of the first order is derived for the "distribution matrix." It is analogous to the classical Boltzmann equation for the distribution function and allows, upon integration, the determination of the macroscopic average value of any spin function in its dependence upon time. This general result is particularly applied to the time dependence of the macroscopic nuclear polarization, and the conditions are investigated under which it satisfies the phenomenological differential equation originally proposed by F. Bloch. (auth)

2108

HIGH-ENERGY NUCLEAR PHYSICS. Bernard T. Feld. Nucleonics 11, No. 2, 42-5, 60(1953) Feb.

This paper is a simplified summary of the discussions held at the Third Annual Conference on high-energy physics at the University of Rochester, Dec. 18-20, 1952. Topics discussed included isotopic spin-selection rules, meson theory, the reaction nucleon + nucleon → d + π, π-meson scattering, photomeson production, and properties of mesons and V particles. (L.T.W.)

2109

PION-NUCLEON SCATTERING WHEN THE COUPLING IS WEAK AND EXTENDED. Geoffrey F. Chew. Phys. Rev. 89, 591-3(1953) Feb. 1.

The symmetrical pseudoscalar meson theory, with an extended pseudovector coupling to the nucleon and neglect of nucleon recoil effects, is shown to be capable of explaining the existing data on the P-wave pion-nucleon scattering. The required sizes of the source radius and coupling constant correspond to a relatively weak pion-nucleon coupling, but reactive effects in the scattering are nevertheless so important that the lowest-order approximation in a perturbation treatment is completely inadequate. The Dancoff approximation, on the other hand, is accurate to within 10 or 20 percent. 13 references. (auth)

2110

A NEW APPROACH TO THE PROBLEM OF HIGHER ORDER CORRECTIONS IN THE MESON THEORY OF NUCLEAR FORCES. J. Werle. Phys. Rev. 89, 527-9(1953) Jan. 15.

The method of successive approximations is applied to a formalism containing both classical and quantum mesodynamics. The following are considered: (1) the case of a pseudoscalar meson field with pseudoscalar meson coupling, (2) an iterative solution of the two-body problem (generally for simultaneous equations of field and motion), and (3) pseudovector and pseudoscalar meson couplings in the case of a pseudoscalar meson field. (L.M.T.)

2111

ON THE SIGNIFICANCE OF THE NOTION OF "LEVEL"; THEORETICAL FOUNDATION OF THE QUASI-ATOMIC MODEL OF THE NUCLEUS. Raymond Daudel. Compt. rend. 235, 1375-7(1952) Dec. 1. (In French)

Recently Lennard Jones and others (see for example, J. Chem. Phys. 20, 1024(1952)) have clarified the fundamental role of the relation between electron positions in explaining the results of theoretical chemistry. This reasoning has now been extended to nuclear structure. As an example, hybridization of the nuclear orbitals of the first completed shell shows the structure of the O^{16} nucleus to be that of four α particles at the points of a regular tetrahedron. This symmetrical configuration explains the high stability of O^{16} and the existence of the magic number 8. (G.Y.)

2112

THE UNIFORM MODEL OF THE NUCLEUS. Izabella Goldin Weinberg and J. M. Blatt. Am. J. Phys. 21, 124-38(1953) Feb.

The uniform model of the nucleus, proposed by Wigner in 1937, assumes that the motion of the nucleons within the nucleus are so complicated, and the interactions between them are so strong, that the details of the motion are of no great importance. This model, therefore, differs diametrically from the shell model of the nucleus, in which each nucleon is assumed to move independently of all others to a first approximation, the various nucleons filling up a regular sequence of possible orbits (shells). In this paper is reexamined the evidence for the uniform model to see whether, in the light of data accumulated since the time the model was proposed, the agreement between the predictions of the uniform model and experimental binding energies is sufficiently good to serve as an argument against the shell model. This is found not to be the case. The uniform model gives qualitative agreement with experiment, but the detailed quantitative agreement is only moderately good. This rather indifferent record must be compared with the excellent evidence for nuclear shell structure in the same region of mass numbers. Nevertheless, the authors feel that the uniform model should not be abandoned altogether, but rather should be reinterpreted to apply to the "characteristic state" postulated by Hurwitz and Bethe, rather than to the ground state. No test of this hypothesis is possible until more is known experimentally about the level spectra of nuclei. In this connection a modified semiempirical form is suggested for the density of nuclear levels as a function of excitation energy. (auth)

2113

ON THE EXCITATION ENERGY OF A HEAVY NUCLEUS DESCRIBED BY A REAL FERMI GAS. F. Ferrari and C. Villi. Nuovo cimento (9) 10, 95-7(1953) Jan. 1. (In English)

According to the Thomas-Fermi model, the theoretical picture of a heavy nucleus having mass number A is based on the assumption that the A nucleons are independent and enclosed in a potential well of nuclear dimensions and depth 35 Mev. In order to remove discrepancies between theoretical expectations and experimental data, the authors have attempted to deduce the equation of state of a real Fermi gas by evaluating the effect of the nuclear interactions and the dependence of the virial on the nuclear temperature T. (G.Y.)

2114

CLASSIFICATION OF "RADII" OF α-EMITTING NUCLEI AS A FUNCTION OF THE NEUTRON EXCESS. I. Salomon Rosenblum and Manuel Valadares. Compt. rend. 236, 196-8 (1953) Jan. 12. (In French)

The radii of the nuclides from Z = 84 to Z = 98 are plotted as a function of atomic number A, and points of equal I = A − 2Z are connected. Effects of magic numbers and branching (β, electron capture, α fine structure) are shown. A minimum beyond Z = 98 is indicated. (G.Y.)

NUCLEAR PROPERTIES

2115

Los Alamos Scientific Lab.

TOTAL NEUTRON CROSS SECTION FOR NORMAL URANIUM, by Richard L. Henkel. Jan. 14, 1953. Decl.

Jan. 27, 1953. 2p. (AECD-3500; LADC-1333)

A plot is presented of the total neutron cross sections for U as a continuous function of neutron energies between 25 kev and 7 Mev and for points measured at 17, 19, and 20 Mev. U cylindrical samples of 1-in. diam. were interposed midway between a neutron source and neutron counters separated by ~20 in. A BF_3 counter was used below 100 kev, a H or He high-pressure recoil counter was used between 100 kev and 7 Mev, and a stilbene-crystal scintillation spectrometer was used above 14 Mev. (L.M.T.)

2116

Argonne National Lab.

ACTIVATION CROSS-SECTIONS MEASURED WITH ANTIMONY-BERYLLIUM PHOTONEUTRONS - II, by Clyde Kimball and Bernard Hamermesh. Jan. 15, 1953. 1p. (AECU-2394; UAC-700)

Additional measurements of activation cross sections using Sb-Be photoneutrons have been made using the technique described by Hummel and Hamermesh (Phys. Rev. 82, 67(1951); NSA 5-1942; cf. NSA 6-3391). The table contains a list of these cross sections relative to Seren's thermal cross section for the given element (Phys. Rev. 72, 888(1947)).

Isotope (A + 1)	Half Life	Natural Atom Cross Section (Millibarns)	Per cent Error
Co^{60}	10.7 min	*7.7	30
Cu^{64}	12.8 hrs	85	25
Ge^{75}	82 min	14	10
Ba^{139}	85 min	53	10
W^{187}	24.1 hr	119	15

*This value is an upper limit. The very small number of counts above background made it difficult to obtain good half-life values. Assigning to the 10.7-min activity all counts above background corresponding to a half life of less than thirty min. yields the value in the table. (Entire report)

2117

Argonne National Lab.

THE THERMAL NEUTRON CAPTURE CROSS SECTION OF HYDROGEN, by B. Hamermesh, G. R. Ringo, and S. Wexler. Jan. 1953. 13p. (AECU-2396; UAC-694)

The thermal neutron capture cross section of H has been measured to be 0.329 b at 2200 m/sec. This was done by measurement of the reduction in the neutron activation rate of NaI in a H_2O solution when boron of a known absorption cross section was added to the solution. (auth)

2118

Brookhaven National Lab.

HALF-LIFE OF 54-MIN In^{116}, by K. W. Downes, G. A. Price, R. Sher, and V. J. Walsh. Jan. 1953. 4p. (BNL-216)

The half life of In^{116} was remeasured since it was considered necessary to know it to within 0.1 min. Six In foils of 0.22 in. diameter and weighing about 27 mg each were irradiated for 5 min in a slow neutron flux of $\sim 10^7$ neutrons/cm^2/sec. After waiting several minutes for short-lived activities to decay, each foil was counted by an Amperex Model 120-C end-window geiger counter. After correction of the counting rates for dead time and background, the rates for the six counters were summed at each counting time to give one decay curve. The value determined was 54.14 ± 0.07 min. (L.M.T.)

2119

Brookhaven National Lab.

CORE ISOMERISM - REMARKS ON Mo^{93m}, by M. Goldhaber. [nd] 2p. (BNL-1338)

It has been pointed out (Goldhaber and Hill, Revs. Mod. Phys. 24, 179(1952)) that 7-hr Mo isomer behaves in some respects as if it were an even-even nucleus. Now that this activity has been definitely assigned to an odd mass number, both by the study of the $Nb^{93}(p,n)$ excitation function (Boyd and Charpie, Phys. Rev. 88, 681(1952)) and by a direct mass spectrographic determination (Alburger and Thulin, Phys. Rev. (in press)) it seems appropriate to discuss the probable mode of excitation of Mo^{93m} further. This isomer lies outside the usual odd A "islands of isomerism," and it appears that we are dealing here with a case of "core isomerism" where the isomerism can be ascribed to an excitation of the even-even core to a high spin state, probably 8+, obtained by breaking a $g_{9/2}$ pair of protons and putting one of the protons into a $g_{1/2}$ state. The odd neutron probably remains in a $g_{7/2}$ state throughout the three-step isomeric transition while the core goes from 8+ → 4+ → 2+ → 0+. Thus the spin of Mo^{93m} may be as high as (8+) + $g_{7/2}$ = 23/2+ and this is supported by the absence of cross-over transitions. (A search for cross-over transitions was made by Alburger, der Mateosian, Friedlander, Goldhaber, Scharff-Goldhaber, and Sunyar (unpublished) who used scintillation counters as well as Be-D photoneutron detectors.) The total excitation energy of Mo^{93m}, 2.43 Mev, is of the order expected on the assumption that it is due to the breaking of a $g_{9/2}$ proton pair (~1 Mev) and the flipping of a spin $g_{9/2} \rightarrow g_{7/2}$ (spin-orbit coupling energy ~1.5 Mev). The low cross section of the $Nb^{93}(p,n)Mo^{93m}$ reaction (Blaser, Boehm, Marmier, and Preiswerk, Helv. Phys. Acta 24, 441(1951)) and the lack of success of attempts to produce Mo^{93m} by (d,p), (n,γ), and (γ,n) reactions (Goldhaber and Hill, above) may be connected with the unusual character of this state. General considerations on even-even nuclei (Scharff-Goldhaber, Phys. Rev. 87, 218A(1952)) indicate that "core isomerism" should be a rare phenomenon. (The question may be raised: Where are the many excited states expected in this energy range (≤2.4 Mev) from the one-particle excitation ($d_{5/2}$, $d_{3/2}$, $h_{11/2}$ ... etc.) and from coupling of the $g_{7/2}$ neutron to the excited states of the core? They may, indeed, be there without showing up in the γ-ray transitions. If their energy does not differ considerably from the states which are populated in the decay of the isomer, they may be by-passed because transitions of minimum spin change will out. They should, however, be expected to show up under different excitation conditions.) (Entire report)

2120

Brookhaven National Lab.

COMPARISON OF THE VALUES OF THE DISINTEGRATION CONSTANT OF Be^7 IN Be, BeO, AND BeF_2, by J. J. Kraushaar, Elizabeth D. Wilson, and Kenneth T. Bainbridge. [nd] 18p. (BNL-1353)

The difference in the decay constants of Be^7 in Be, BeO, and BeF_2 have been measured using the differential ionization-chamber technique. The results are: $\lambda(Be) - \lambda(BeF_2) = 7.41 \pm 0.47 \times 10^{-4}\ \lambda$; $\lambda(BeO) - \lambda(BeF_2) = 6.09 \pm 0.55 \times 10^{-4}\ \lambda$; and $\lambda(Be) - \lambda(BeO) = 1.31 \pm 0.51 \times 10^{-4}\ \lambda$. These values are smaller than the results previously obtained by Leininger, Segrè and Wiegand for the same compounds, but support their earlier work. (auth)

2121

Brookhaven National Lab.

THE PARAMETERS FOR THE SLOW NEUTRON RESONANCE IN RHODIUM, by V. L. Sailor. [nd] 17p. (BNL-1354)

There is presented a method of analysis of slow neutron resonances which may be applied to cases where the instrumental resolution is good and the Doppler broadening is small. Measurements of the 1.26 ev resonance in rhodium made with a crystal spectrometer have been analyzed by this method and the following values were obtained for the

parameters: $E_0 = 1.260 \pm 0.004$ ev, $\sigma_0 = 5046 \pm 200 \times 10^{-24}$ cm^2, $\Gamma = 0.156 \pm 0.005$ ev, $g\Gamma_n = 3.8 \pm 0.2 \times 10^{-4}$ ev, and $\sigma_s^I = 5.5 \pm 1.0 \times 10^{-24}$ cm^2. The shape of the resonance agrees to very high accuracy with the one-level Breit-Wigner formula. (auth)

2122

Rochester Univ.

ON THE CHARGE INDEPENDENCE OF NUCLEAR FORCES, by David Feldman. Jan. 13, 1953. 6p. (NYO-3708)

Some consequences of the charge-independence hypothesis for high-energy n-p and p-p scattering are pointed out. If the physically distinguishable reactions are represented by $p_1 + p_2 \rightarrow p_3 + p_4$, $n_1 + p_2 \rightarrow n_3 + p_4$, and $n_1 + p_2 \rightarrow p_3 + n_4$, where the subscripts refer to preassigned momenta and spins, and if f and g denote isotropic triplet and singlet scattering respectively, the scattering amplitudes for the 3 reactions are f, $\frac{1}{2}$ (f + g), $\frac{1}{2}$ (f−g), and, after normalization, the corresponding differential cross sections are $\sigma_{pp} = |f|^2$, $\sigma_{np} = \frac{1}{4}|f+g|^2$, $\sigma_{pn} = \frac{1}{4}|f-g|^2$. Inequalities relating these cross sections are derived for the center-of-momentum system which may be used as a test of the charge-independence hypothesis. The considerations applicable to nucleon-nucleon scattering are extended to the case of scattering of light nuclei by light nuclei. It is pointed out that restrictive inequalities of the sort considered always appear in the comparison of reactions differing only as to charge assignments, but these inequalities may already be included in whatever restrictive inequalities are under consideration. (L.T.W.)

2123

AVERAGE NEUTRON TOTAL CROSS SECTIONS IN THE 3- TO 12-MEV REGION. Norris Nereson and Sperry Darden. Phys. Rev. 89, 775-85(1953) Feb. 15.

An experiment is described for measuring average neutron total cross sections over the 3- to 12-Mev energy region. The neutron source is a collimated beam of fast neutrons emerging from the Los Alamos Fast Reactor, and the detector is a proton-recoil ionization chamber which serves as a neutron spectrometer. The average energy spread of the measurements is around 10%, and the over-all accuracy of the cross-section determinations is ±10% or better. Total cross-section results are presented for H, Be, C, O, Al, Si, S, Fe, Cu, Zr, Pb, Bi, and U. Neighboring elements above Fe are observed to exhibit regularities in their total cross-section patterns. (auth)

2124

CROSS SECTION FOR THE REACTION $D(d,p)H^3$. C. F. Cook and J. R. Smith. Phys. Rev. 89, 785-6(1953) Feb. 15.

Cross sections for the reaction $D(d,p)H^3$ have been measured between 50 and 100 kev, using thin targets of D absorbed in Zr. With the angular distribution data of Wenzel and Whaling, the total cross sections have been calculated. The total cross section at 100 kev is measured to be 14.8 mb. A gas target was used to determine the cross section at 420 kev. The value obtained was 49.3 mb. (auth)

2125

THE HALF-LIFE OF Ca^{45}. C. F. G. Delaney and J. H. J. Poole. Phys. Rev. 89, 529-30(1953) Jan. 15.

Because of discrepancies in the previously determined values of the Ca^{45} half life (180 ± 10 and 152 days), the value was redetermined. The decay of $CaCO_3$ irradiated for a day in the Harwell pile was followed with an end-window G-M counter. The active material was contained in a brass source holder sealed off with thin cellophane to prevent any change or losses. The activity fell from 3934 to 1668 cpm in 202 days, giving a value of 163.5 days for the half life. (L.M.T.)

2126

THE MASS DIFFERENCE $Si^{27} - Al^{27}$. J. D. Kington, J. K. Bair, R. R. Carlson, and H. B. Willard. Phys. Rev. 89, 530 (1953) Jan. 15.

The $Al^{27}(p,n)Si^{27}$ threshold has been found to be 5.819 ± 0.010 Mev using a 5.5-Mev electrostatic generator. From this the calculated value of the mass difference $Si^{27} - Al^{27}$ is 0.00519 amu and the Si^{27} disintegration energy is 3.81 ± 0.01 Mev. (auth)

2127

THE GROUND STATE HYPERFINE STRUCTURE AND NUCLEAR MAGNETIC MOMENT OF PRASEODYMIUM. Hin Lew. Phys. Rev. 89, 530(1953) Jan. 15.

The hyperfine structure of the ground state of praseodymium was studied by the atomic-beam magnetic resonance method. Transitions between magnetic levels belonging to the same total quantum number F and between magnetic levels belonging to different F were observed. From the former transitions and the previously known nuclear spin value of $\frac{5}{2}$, the total electronic angular momentum of the atom in the ground state was found to be $\frac{5}{2}$ and the g_J value of this state to be 0.727 ± 0.005. Since this value of the Landé g factor is exactly that of a $^4I_{\frac{5}{2}}$ state in Russell-Saunders coupling, it seems most likely that the atomic ground state of Pr is a $^4I_{\frac{5}{2}}$. (auth)

2128

NUCLEAR GYROMAGNETIC RATIOS. IV. Yu Ting and Dudley Williams. Phys. Rev. 89, 595-6(1953) Feb. 1.

The super-regenerative oscillator techniques described in earlier reports have been employed to observe nuclear magnetic resonance absorption by B^{10}, N^{14}, Cl^{35}, Cl^{37}, As^{75}, In^{113}, In^{115}, and Bi^{209}. Nuclear g factors and magnetic moments of these nuclei are tabulated for comparison with corresponding values obtained by other techniques. 18 references. (auth)

2129

PSEUDO-QUADRUPOLE EFFECT FOR NUCLEI IN MOLECULES. Norman F. Ramsey. Phys. Rev. 89, 527(1953) Jan. 15.

This note considers, in addition to the pseudo-quadrupole effect pointed out by Foley (Phys. Rev. 72, 504(1947)), two other magnetic terms which give rise to apparent nuclear quadrupole moments of similar magnitude. One corresponds to the direct or low-frequency term in the diamagnetic susceptibility of molecules and the other is due to the electron spins of the molecule. (L.M.T.)

2130

Z-DEPENDENCE OF THE PAIR PRODUCTION CROSS SECTION AT 1.33 AND 2.62 MEV. Irving E. Dayton. Phys. Rev. 89, 544-51(1953) Feb. 1.

The Z dependence of the pair-production cross section has been measured at 1.33 Mev for Al, Cu, Sn, and Pb, and at 2.62 Mev for Be, C, Al, Cu, Sn, and Pb. A target is used which is thick for the positrons produced in it but thin for the incident gamma-ray beam. The positrons stop in the target and are detected by observing their annihilation radiation with two NaI(Tl) scintillation counters in coincidence. At both energies the Z dependence of the cross section is best represented by an equation of the form $aZ^2 + bZ^4$. If it is assumed that the Born approximation calculations of the cross section give the correct value in the limit of low Z, then in Pb at 2.62 Mev the measured cross section is 23% higher than the value calculated from the Born approximation, and 104% higher at 1.33 Mev. All these results are in good agreement with the exact numerical calculations of Jaeger and Hulme. The present measurement shows that near threshold the pair-production cross section in Pb is considerably higher than the Born approximation calculation, whereas at energies between 17 and 280 Mev the value has been measured to be 10 to 15% lower than that calculated from the Born approximation. The crossover appears to occur at around six Mev. 31 references. (auth)

2131
SELF-QUENCHED SUPER-REGENERATIVE DETECTOR FOR NUCLEAR MAGNETIC RESONANCE. G. Suryan. J. Indian Inst. Sci. A35, 25-30(1953) Jan.

The self-quenched super-regenerator has been used to obtain nuclear magnetic resonance signals and has been found to be simple and sensitive. Experiments with the use of a r-f coil capable of being rotated with respect to the magnetic field have indicated that the apparatus could be made to respond to induction or absorption. The signal-to-noise ratio of the apparatus has been determined and is about one-tenth the ultimate possible with the bridge method. (auth)

2132
INTENSITIES OF NUCLEAR MAGNETIC RESONANCES IN CUBIC CRYSTALS. G. D. Watkins and R. V. Pound. Phys. Rev. 89, 658(1953) Feb. 1.

Sands and Pake (Bull. Am. Phys. Soc. 27, No. 5, 11(1952)) report puzzling results from attempts to determine the spin of Si^{29} by comparing the intensity of its magnetic resonance absorption with that of I^{127} in cubic crystalline KI. The present authors report on some observations on shapes and intensities of nuclear magnetic resonance lines of Br^{79}, Br^{81}, and I^{127} in crystalline KBr and KI which seem relevant to the interpretation of the results of Sands and Pake. (L.T.W.)

2133
NUCLEAR SIGNALS DEPENDENCE ON THE RADIOFREQUENCY FIELD AND PARAMAGNETIC CATALYST. G. Chiarotti and L. Giulotto. Nuovo cimento (9) 10, 54-71 (1953) Jan. 1. (In English)

An apparatus for nuclear-signals amplitude measurements is described. With this arrangement measurements of absorption-signals amplitude from protons contained in aqueous solutions of ferric nitrate at various concentrations and various r-f field values have been carried out. In order to explain the results obtained, an approximate theory on nuclear magnetic resonance is developed assuming that the surplus of spins in the lower states is uniformly distributed over a certain frequency range. The theory takes into account the memory effects that occur when the thermal relaxation time is of the order of the sweep period. In this way a general formula is obtained which gives the energy absorbed during a passage. The experimental results agree satisfactorily with this theory. The comparison of experimental results with theory enables relaxation times to be determined over a certain concentration range. They agree well with the results given by other authors. (auth)

2134
CALCULATION OF THE WIDTH OF THE NUCLEAR PARAMAGNETIC ABSORPTION LINE IN A LIQUID. Yves Ayant. Compt. rend. 236, 198-200(1953) Jan. 12. (In French)

An expression for the widening of nuclear magnetic resonance lines in liquids caused by spin-medium relaxation, fluctuations in the longitudinal component of the local magnetic field, and the "flip-flop" effect is derived. (G.Y.)

2135
THE THERMAL NEUTRON ABSORPTION CROSS SECTION OF SCANDIUM. E. E. Lockett and E. Bowell. Phys. Rev. 89, 657-8(1953) Feb. 1.

The thermal-neutron-absorption cross section of Sc was measured in an attempt to resolve the inconsistencies in the published literature. The Sc absorption cross section for pile neutrons, after allowing for contribution from impurities, was found to be ~23 barns, in agreement with recent revised measurements by various authors. (L.T.W.)

2136
STATES OF S^{33} AND Si^{29} FROM (d,p) STRIPPING. J. R. Holt and T. N. Marsham. Phys. Rev. 89, 665-6(1953) Feb. 1.

By observing the angular distribution in the range 0 to 90° of groups of protons from the reactions $S^{32}(d,p)S^{33}$ and $S^{32}(d,p)Si^{29}$ with 8-Mev deuterons, the appropriate orbital angular momentum of the captured neutron was determined in each case. The relative neutron capture probability for each proton group was found to be proportional to the nuclear capture probability for the neutron within the deuteron when the neutron arrives at the nuclear surface with the correct angular and linear momenta to form the final state. It is expected that the capture probability will be greatest when the neutron is captured into a state of single-particle excitation. In the reaction $S^{32}(d,p)S^{33}$ the sequence of orbital angular momenta of the transitions with greatest values of capture probability is 2,3,1,1, where the first belongs to the transition to the ground state. It is suggested that the states of S^{33} corresponding to the proton groups p_9, p_4, p_5, p_{11}, and having angular momenta 2,3,1,1, are states formed by neutron capture into orbits $1d_{\frac{3}{2}}$, $2p_{\frac{3}{2}}$, $2p_{\frac{1}{2}}$, while the core S^{32} remains unexcited. The proton groups associated with low values of capture probability correspond to states requiring excitation of one or more particles of the core. The first excited state with spin $\frac{1}{2}$ is probably produced by a neutron from the $2s_{\frac{1}{2}}$ level of the core being lifted to the $1d_{\frac{3}{2}}$ level to form a pair of resultant spin 0 with the captured neutron. In the reaction $Si^{28}(d,p)Si^{29}$ the sequence of values of angular momenta associated with the largest values of the capture probability is 0,2,3,1. The states of Si^{29} are deduced by the same method as above. (L.T.W.)

NUCLEAR REACTORS

2137
DUAL-PURPOSE REACTORS; FIRST STEP IN INDUSTRIAL NUCLEAR POWER DEVELOPMENT. Carroll A. Hochwalt and Philip N. Powers. Nucleonics 11, No. 2, 10-13(1953) Feb.

Design and cost factors of a dual-purpose reactor for the production of Pu and useful power are described. Proposals for the initiation of a program for the industrial development of power breeder reactors are outlined. (L.T.W.)

2138
DESIGN OF A CONTROL SYSTEM FOR A LOW-COST RESEARCH REACTOR. T. E. Cole. Nucleonics 11, No. 2, 32-7(1953) Feb.

The low-cost research reactor is a prototype of the so-called "swimming pool" reactor at Oak Ridge National Laboratory. The active lattice consists of enriched U and is immersed in a tank of water, which serves as the cooling and moderating medium. Neutron balance, excess reactivity requirements, safety and control instrumentation, and operating instruments are described. (L.T.W.)

NUCLEAR TRANSFORMATION

2139
Michigan Univ.
ASSIGNMENT OF Y^{92} AND Y^{94}, by G. L. Schott and W. Wayne Meinke. [nd] 4p. (AECU-2392)

The mass assignments of Y^{92} and Y^{94} were checked by comparing relative yields of Y^{90}, Y^{92}, and Y^{94} after bombarding high-purity Zr metal with 7.8-Mev deuterons. After chemical separation, the decay of the samples was followed for several weeks to determine the relative yields of the Y isotopes formed. The results show good agreement with the theoretical yields, which lends strong support to the assignment of the 16.5-min activity to Y^{94} and the 3.5-hr activity to Y^{92}. (L.M.T.)

2140
THE COUPLING OF ANGULAR MOMENTA IN NUCLEAR REACTIONS. R. F. Christy. Phys. Rev. 89, 839-42(1953) Feb. 15.

Seven nuclear reactions have been examined where the angular distribution of reaction products depends on the type of coupling of angular-momentum vectors in the nucleus. In six of the seven, the experimental angular distri-

bution is consistent with the assumption of Russell-Saunders coupling in the nucleus. In three of the seven, the experiments are consistent with the assumption that the bombarding particle brings a definite j in the reaction. Neither assumption is sufficient to explain the result in one reaction (B^{11} + p). (auth)

2141

NUCLEAR GAMMA-RAYS FROM LOW ENERGY PROTON BOMBARDMENT OF SODIUM, MAGNESIUM, AND ALUMINUM. Harvey Casson. Phys. Rev. 89, 809-20(1953) Feb. 15.

The γ rays produced by the resonance capture of 200- to 415-kev protons in Na, Mg, and Al have been investigated with a single-crystal NaI(Tl) scintillation spectrometer. Excited states in Mg^{24}, Al^{25}, Al^{27}, and Si^{28} with energies above the ground state of 12, 2.5, 8.6, and 12 Mev, respectively, were found to decay by cascade γ emission. Direct transitions to the ground state of Mg^{24}, Al^{27}, and Si^{28} were not observed. Observed pulse-height distributions, location of observed peaks, identifiable γ rays and their relative intensities are given. Decay schemes are proposed to account for the observed γ rays of Al^{27}, Si^{28}, and Al^{25}. They are found to involve energy levels which are in general agreement with levels found in (d,n) and (p,p) scattering experiments; in the case of Al^{25}, with levels found in the mirror nucleus Mg^{25}. An estimate is made of the absolute proton-capture probability in the targets used. 20 references. (auth)

2142

NEUTRON ENERGY DISTRIBUTION FROM THE PROTON BOMBARDMENT OF Li, Be, AND C AT 375 MEV. Warren F. Goodell, Jr., Howard H. Loar, Richard P. Durbin, and William W. Havens, Jr. Phys. Rev. 89, 724-7(1953) Feb. 15.

High-energy neutrons were produced by bombarding Li, Be, and C targets with protons having a maximum energy of 375 Mev. The energy spectrum of the neutrons emitted in the forward direction was measured by determining the range spectrum of recoil protons scattered at 45° by a polyethylene scatterer. A telescope of stilbene crystals with Cu range-determining absorbers was used as a detector. The neutron beam was monitored by a Bi-fission ionization chamber. For elements studied, the width of the neutron-energy distribution broadens and the energy of the peak of the distribution decreases as the atomic number of the target material increases. 13 references. (auth)

2143

SPECTRUM OF γ RADIATION EMITTED IN THE REACTION $B^{10}(n,\alpha)Li^{7*}$, $Li^{7*} \rightarrow Li^{7} + \gamma$. A. Bracci, U. Facchini, and A. Malvicini. Nuovo cimento (9) 9, 1237-9(1952) Dec. (In Italian)

The γ spectrum of the $B^{10}(n,\alpha)Li^{7}$ reaction has been determined with a scintillation spectrograph. A peak at 0.477 Mev corresponds to the decay of the Li^{7*} intermediate excited state. (G.Y.)

2144

HIGH-ENERGY PROTON STARS IN NUCLEAR EMULSIONS. M. Ladu. Nuovo cimento (9) 10, 108-10(1953) Jan. 1. (In Italian)

Ilford G5 emulsions were exposed to the 240-Mev proton beam of the Rochester cyclotron, and 1190 stars subsequently found were analyzed in detail as to number of prongs, number of fast prongs, angular distribution, etc. A mean free path in the emulsion of 29.2 cm was found for the protons. Nuclear transparency to 240-Mev protons was evident. (G.Y.)

2145

SOME REMARKS ON THE PHOTO-DISINTEGRATION OF DEUTERON. I. Yukio Nagahara and Jun Fujimura. Progress Theoret. Phys. (Japan) 8, 49-52(1952) July.

The photodisintegration process of the deuteron is investigated by extrapolating from the low-energy side, and the contribution of mesons is also discussed. The singularity of exchange magnetic moments gives some possibility of explaining the experiments. (auth)

2146

GENETICS OF THE Ge^{78}–As^{78} FISSION CHAIN. Nathan Sugarman. Phys. Rev. 89, 570-2(1953) Feb. 1.

The half life of Ge^{78}, measured by isolation of the 91.0 ± 0.6-min As^{78}, is 86.0 ± 1.0 min. No evidence for the ~40-min As reported in fission was found. The fission yields of Ge^{77}, As^{77}, Ge^{78}, and As^{78} are reported. 11 references. (auth)

2147

THE ISOMER Rb^{84m}. R. S. Caird and Allan C. G. Mitchell. Phys. Rev. 89, 573-4(1953) Feb. 1.

With the help of scintillation counters, information on the isomer Rb^{84m} has been obtained. The isomer was produced by an (n,2n) bombardment of ordinary Rb salts. The half life has been determined as 21 min. Three γ rays have been observed at 0.239, 0.463, and 0.890 Mev. The last γ ray occurs in the product Kr^{84}. Coincidence measurements show coincidences between the γ ray at 0.239 Mev and another of nearly the same energy, while coincidences between the 0.463 and the γ rays at 0.239 Mev are essentially negligible. A possible level scheme is discussed. (auth)

2148

ELECTRON-INDUCED SHOWERS IN COPPER. Asher Kantz and Robert Hofstadter. Phys. Rev. 89, 607-17(1953) Feb. 1.

An experimental determination has been made of the radial and longitudinal distribution of energy produced in showers initiated by electrons of 118 and 157 Mev in Cu. A small crystal CsBr(Tl) coupled to a thin light pipe and photomultiplier was used as a probe. Graphs of the radial distributions are given from which, by numerical integration, transition curves are determined. Calculations are made for an approximately optimum design of scintillation crystal [e.g., NaI(Tl)] to capture a large fraction of the energy within a shower. (auth)

2149

NEW LONG-LIVED MAGNESIUM-28 ISOTOPE. R. K. Sheline and N. R. Johnson. Phys. Rev. 89, 520-1(1953) Jan. 15.

Mg^{28} was produced, in the reaction $Si^{30}(\gamma,2p)Mg^{28}$, by irradiating elemental Si with the γ spectrum of a betatron and, in the reaction $Mg^{26}(\alpha,2p)Mg^{28}$, by bombarding ordinary Mg metal in an external beam of α particles from a cyclotron. The evidence for the assignment of this activity to Mg^{28} is presented but no decay scheme is given. (L.M.T.)

2150

ACTIVITIES IN LIGHT NUCLEI FROM NITROGEN ION BOMBARDMENT. L. D. Wyly and A. Zucker. Phys. Rev. 89, 524-5(1953) Jan. 15.

Several elements were bombarded by 25-Mev N^{+3} ions in the Oak Ridge National Lab. 63-in. cyclotron. Observed activities are reported for D, Be, C, N, and O. (L.M.T.)

2151

RADIOCHEMICAL STUDIES ON THE FISSION OF Th^{232} WITH Li + D NEUTRONS. A. Turkevich, J. B. Niday, and Althea Tompkins. Phys. Rev. 89, 552-5(1953) Feb. 1.

The fission of Th^{232} with neutrons from Li bombarded with 7.6-Mev deuterons has been investigated radiochemically. The relative yields of fourteen mass chains, mostly in the light group, have been determined. The yields of symmetrical products are about tenfold higher than in the fission of Th^{232} with pile neutrons. Very light mass chains (very asymmetric fission) show a much smaller increase in yield. 20 references. (auth)

2152

A SELECTION RULE FOR THE REACTION $^{6}Li(\gamma,d)^{4}He$. A. Gamba and V. Wataghin. Nuovo cimento (9) 10, 174-5

(1953) Feb. 1. (In English)

The cross section for low-energy γ rays of the $Li^6(\gamma,d)He^4$ reaction is so low as to suggest the existence of selection rules. Such a selection rule is deduced, using the formalism developed by Gamba et al. (NSA 6-5478). (G.Y.)

2153

ON THE GROWTH OF A COSMIC RAY INITIATED JET IN A NUCLEUS. F. C. Roesler and C. B. A. McCusker. Nuovo cimento (9) 10, 127-44(1953) Feb. 1. (In English)

The cascade in the nucleus is investigated with a view to the interpretation of extreme-energy stars from heavy nuclei. It is assumed that a clean tunnel is punched through the nucleus and that the cross section of this tunnel determines the supply of collision partners for the cascade. The tunnel shows a trumpet-like spread but is nearly cylindrically shaped at the highest energies. The spread of the cascade is treated with a diffusion equation of the Fokker-Planck type, considering the second moments. The mass-development is treated by introducing an indetermined function which can be chosen to represent multiple, plural, or mixed theories of meson production. The present observational evidence is discussed and shown not yet to decide the choice; experiments which offer no new or special difficulties would probably fix it. (auth)

2154

PHOTODISINTEGRATIONS. I. HISTORICAL SKETCH AND BIBLIOGRAPHY. II. SOME EXPERIMENTAL RESULTS AND COMPARISON WITH VARIOUS THEORIES. Raymond Chastel. J. phys. radium 14, 50-61(1953) Jan. (In French)

A review. 123 references. (G.Y.)

2155

THE CROSS SECTION FOR $Ta^{181}(\gamma,2n)Ta^{179}$ AT 17.6 MEV. J. H. Carver, R. D. Edge, and D. H. Wilkinson. Phys. Rev. 89, 658-9(1953) Feb. 1.

The ratio of the $(\gamma,2n)$ cross section of Ta^{181} at 17.6 Mev to the (γ,n) cross section at 14.6 Mev was found to be 0.29 ± 0.11. On the assumption that the form of the $(\gamma,2n)$ cross section above 18 Mev is the same as that of the (γ,n) process and at lower energies it is derivable from the total cross section and the statistical theory of the (γ,n) vs. $(\gamma,2n)$ competition, the total nuclear absorption cross section is constructed from the measurement at one energy. (L.T.W.)

PARTICLE ACCELERATORS

2156

Radiation Lab., Univ. of Calif., Berkeley

THE RADIOFREQUENCY FINE STRUCTURE OF THE PHOTON BEAM FROM THE BERKELEY SYNCHROTRON, by Richard Madey, Kenneth C. Bandtel, and Wilson J. Frank. Dec. 17, 1952. 16p. (UCRL-2052)

The full-energy spread-out bremsstrahlung beam of the Berkeley synchrotron was shown to be emitted in sharp bursts with the 47.7-Mc frequency of the electrons in the doughnut. A two-counter telescope, located about 20 in. away from a 0.25-in. Pb target and about 20° from the photon beam direction, was used to measure an accidental coincidence counting rate as a function of the length of delay line in one input to the coincidence circuit. When the length of delay cable was chosen equal to integral multiples of the period of the r-f oscillator, the coincidence counting rate was of the order of 100 counts per unit of integrated beam; on the other hand, when the length of delay line was chosen to be equal to one-half of odd integral multiples of the period of the r-f oscillator, the coincidence counting rate was less than about two counts per unit of integrated beam. An estimate of the width of a single pulse of photons can be obtained from the measurement by unfolding a gaussian resolution function of the coincidence circuit. If the time variation of the intensity of the photon beam is assumed to be a gaussian function, then the rms value of that gaussian is found to be less than 1.5×10^{-9} sec. A calculation by E. M. McMillan (private communication) indicates that the full-energy photon beam should exhibit fine structure if the amplitude of the azimuthal phase oscillations at full energy is less than about one radian. The experimental result is another confirmation of the theory of phase stability. (auth)

2157

ACCELERATION OF HEAVY IONS TO HIGH ENERGIES. D. Walker and J. H. Fremlin. Nature 171, 189-91(1953) Jan. 31.

Technical considerations in the acceleration of ions heavier than He^4 are discussed, and experience with the 60-in. fixed-frequency cyclotron at the University of Birmingham, England, is described. Heavy-ion work in the United States and a number of experimental studies with heavy-ion beams are reviewed. 19 references. (G.Y.)

2158

PROPER OPERATING CONDITIONS FOR THE ELECTRON CYCLOTRON. Christoph Schmelzer. Z. Naturforsch. a7, 808-17(1952) Dec. (In German)

On the basis of resonance restriction for relativistic cyclotron operation, the conditions are discussed under which the greatest possible acceleration is obtained for a given diameter of the magnetic field and for arbitrary values of the resonance voltage. Graphical processes are applied to investigation of phase stability of the electron orbits, energy inhomogeneity of the electron beam, and other important magnitudes. The resonance acceleration occurs during $^1/_{12}$ of the period of the accelerating field at the maximum. The homogeneity of the electron beam considerably exceeds that of an equivalent linear accelerator. Conditions under which a negative internal resistance in the electron beam gives rise to instability are discussed qualitatively. Transit-time effects in the acceleration gap are unavoidable and can lead to drastic reduction of the range of phase stability. These can be made harmless by correct selection of operating conditions or by means of special accelerating systems. (tr-auth)

2159

TWO SYSTEMS FOR THE SYNCHRONIZATION OF PULSED HIGH-ENERGY ION BEAMS. G. von Dardel, E. Hellstrand, and C. Taylor. Applied Sci. Research (Netherlands) B3, 35-46(1952).

When the ion source of a high-voltage particle accelerator is modulated with pulses, e.g., for neutron time-of-flight studies, it is often necessary that synchronization should be maintained between these pulses and some electronic time-analyzing equipment. If the ion source is in a high-voltage electrode, some communication link to it must be provided. Two such links are described, one using a r-f system at 450 Mc, the other using a pulsed beam of light. Both systems provide control over pulse width as well as pulse spacing. The r-f system will transmit pulses down to 1 μsec and is suitable for open accelerators. The optical system will transmit pulses down to 4 μsec and may be used with either open or pressurized accelerators. (auth)

2160

PULSABLE NEUTRON GENERATOR. E. Gatti, G. Perona, and A. Persano. Nuovo cimento (9) 10, 80-6(1953) Jan. 1. (In Italian)

An arrangement consisting of a 400-kv Cockcroft-Walton deuteron accelerator supplied with a pulsable ion source and equipped for time-of-flight spectrography of slow neutrons is described. (G.Y.)

2161

A NEW FOCUSING PRINCIPLE APPLIED TO THE PROTON LINEAR ACCELERATOR. J. S. Bell. Nature 171, 167-8 (1953) Jan. 24.

The new focusing principle recently announced by Brook-

haven National Lab. for synchrotrons is discussed for linear accelerators. It is pointed out that there is only a minimum of interference with the r-f system if the necessary fields are set up in the drift tubes of a Berkeley-type accelerator and that only simple modification of the tubes is necessary if electric rather than magnetic fields are used. A method of applying electric fields is illustrated and the results of the author's calculations for the suggested setup are discussed. (L.M.T.)

2162

SYNCHROTRON MAGNET CONSTRUCTION. O. Wernholm. J. Sci. Instruments 29, 166-7(1952) May.

The electron synchrotron is usually combined with a betatron which injects particles into the synchrotron. Arrangement of the betatron flux bars to achieve electron energies of 2 to 3 Mev produced eddy currents in the field magnet. The field irregularities can be reduced by use of a separate magnetic circuit for the betatron. Inside the pole gap is a backwound coil with the same number of turns as the magnetizing coils. This coil prevents flux leakage from the poles to the betatron core. In a preliminary test on a 35-Mev synchrotron the guide-field irregularities were reduced to 1/4 of those before, and correction coils have become unnecessary. The total inductance of the magnet became lower, a given current was obtained at a lower voltage, and the nonlinearity of the inductance of the betatron coil was less influential on the total inductance of the magnet. (L.T.W.)

RADIATION ABSORPTION AND SCATTERING

2163

MULTIPLE SCATTERING CORRECTIONS TO THE IMPULSE APPROXIMATION IN THE TWO-BODY SYSTEM. K. A. Brueckner. Phys. Rev. 89, 834-8(1953) Feb. 15.

Exact solutions for the scattering of a fast particle by two heavy scatterers are obtained and compared with the usual treatment of the impulse approximation in which multiple scattering is neglected. It is found that the multiple scattering qualitatively changes the solution except in the extreme Born approximation limit. The methods developed are applied to the isotopic-spin-dependent, but spin-independent, scattering of mesons in the deuteron. It is found that if high-energy scattering is assumed to be in the isotopic spin 3/2 state, a considerable depression in the total cross section can be expected for phase shifts larger than 45 degrees. (auth)

2164

POLARIZATION EFFECTS IN NUCLEON-NUCLEON SCATTERING. Don R. Swanson. Phys. Rev. 89, 749-52 (1953) Feb. 15.

If a beam of unpolarized nucleons is scattered from a target of unpolarized nucleons, the scattered particles are polarized (in a direction normal to the scattering plane) provided that the interaction contains tensor or spin-orbit forces. The polarization can be detected by means of a second similar scattering since the cross section then contains an azimuthal dependence $I(\theta,\phi) = I_0(\theta)(1 + \epsilon \cos\phi)$, where $\epsilon(\theta)$ is essentially the square of the polarization. Calculations are carried out for a double p-p scattering using the tensor interaction described in the preceding paper, and for a double n-p scattering using the central and tensor potential of Christian and Hart (containing the "half-exchange" dependence proposed by Serber). The polarization produced by the first scattering at the optimum angle of $\theta \approx 50°$ was found to vary from 6% at 40 Mev to 33% at 285 Mev for n-p scattering and from 10% at 129 Mev to 15% at 350 Mev for p-p scattering. The n-p results (previously published) are consistent with the azimuthal asymmetry detected in a double-scattering experiment reported by L. Wouters. (Phys. Rev. 84, 1069(1951)). (auth)

2165

A CLOUD-CHAMBER STUDY OF THE SCATTERING OF FAST NEUTRONS IN OXYGEN. J. P. Conner. Phys. Rev. 89, 712-14(1953) Feb. 15.

Neutrons with an energy of 14.1 Mev have been scattered in O_2 gas, and the recoil O nuclei observed in a cloud chamber operated at a pressure of 1/4 atmosphere. Recoils from elastically scattered neutrons were resolved from recoils due to inelastic scattering. The results indicate a strong asymmetry in the angular distribution of elastically scattered neutrons; the angular distribution has maxima at 0, 80, and 180° and minima at 60 and 130°. Within a factor of 2, the angular distribution for the inelastically scattered neutrons is symmetrical. The probability per unit energy interval that the O nucleus will be left excited is about 5 times as large at 6-Mev excitation as at 12 Mev. The cross section of O for 14.1-Mev neutrons is 0.7×10^{-24} cm^2 for elastic scattering, 0.5×10^{-24} cm^2 for inelastic scattering, and 0.4×10^{-24} cm^2 for disintegration. (auth)

2166

A METHOD FOR THE COMPUTATION OF PLURAL AND MULTIPLE SCATTERING CORRECTIONS. J. Blok and C. C. Jonker. Physica 18, 809-22(1952) Nov.

A method is given to compute the angular distribution of scattered particles starting from a function for the differential cross section; this angular distribution depends on single, plural, and multiple scattering. The thickness of the scatterer has been taken about equal to the mean free path of the particles inside the scatterer. An application is given for the case of scattering of thermal neutrons by a thin sheet of paraffin. In the appendix is discussed the differential cross section in the laboratory system for the scattering of thermal neutrons by paraffin. (auth)

2167

SCATTERING OF THERMAL NEUTRONS BY BOUND PROTONS AND DEUTERONS. J. Blok and C. C. Jonker. Physica 18, 823-35(1952) Nov.

With a neutron howitzer and a Ra-Be source (400 mg Ra) some experiments were performed on the angular distribution of thermal neutrons scattered in paraffin, water, heavy water, ice, and heavy ice. By using a method previously described, some data on the differential cross section for the scattering processes have been found. The differential cross section of paraffin, water, and ice differ much from spherical symmetrical functions; for heavy water and heavy ice the differences are much smaller. For paraffin the distribution computed after the model of Arley deviates from the experimental values; the experimental data suggest a more forward directed scattering. From the data for water and ice, it may be concluded that the binding of the proton in ice is stronger than in water. Interference effects were observed; especially in the curves for heavy water and heavy ice. (auth)

2168

ON THE ANGULAR DISTRIBUTION OF D + D NUCLEAR REACTION PRODUCTS. Yoshihiro Nakano. Progress Theoret. Phys. (Japan) 8, 39-48(1952) July, (cf. NSA 3-2318)

The anisotropy coefficients of the angular distribution of D + D → H + T reaction products, $I(\theta) = A(1 + B\cos^2\theta + C\cos^4\theta)$, are reproduced theoretically, taking into account D-wave and spin-orbit coupling in the higher-energy range up to 3.5 Mev. (auth)

2169

NEUTRON SCATTERING BY COUPLED PARAMAGNETIC IONS. Phillip J. Bendt. Phys. Rev. 89, 561-9(1953) Feb. 1.

The paramagnetic scattering of very low-energy neutrons by MnF_2 and MnO was studied at various sample temperatures. The assumption of Van Vleck that a gaussian distribution can be used to represent the frequency of inelastic

scattering events vs. energy transfer with the spin lattice is used, and the rms half width of the distribution of energy transfer for MnF_2 is found to be 0.0020, 0.0026, and 0.0034 ev at 610, 300, and 126°K, respectively. Short-range order scattering modifies the scattering cross section for MnF_2 to the extent of $1.5/4\pi$ b/sterad at 126°K, but is not observed at higher temperatures. Measurements at 300°K indicate the magnetic scattering cross section for MnO_2 if it were not distorted by short-range order scattering, would be about $2.5/4\pi$ b/sterad lower than for MnF_2. We suggest this may be accounted for by the mechanism of super-exchange between crystal ions. Rough values of a parameter indicating the range of spin order in MnO were determined at 300 and 133°K. The amount of spin order increases with decrease in sample temperature. Above the Néel temperature, it is found that most of the correlation of spin direction exists only between adjacent ions on the same sublattice. 15 references. (auth)

2170

MULTIPLE SCATTERING AND THE MANY-BODY PROBLEM; APPLICATIONS TO PHOTOMESON PRODUCTION IN COMPLEX NUCLEI. Kenneth M. Watson. Phys. Rev. 89, 575-87(1953) Feb. 1.

A study is made of the scattering of fast particles by atomic nuclei. A rigorous (formal) solution to the many-body Schroedinger equation is given which has the structure of a multiply scattered wave. The relation of this solution to the "impulse approximation" is discussed. A decomposition of the wave function into "coherent" and "incoherent" parts is effected. This makes it possible to derive the familiar "optical models" directly, as well as to find systematic corrections to these models. The theory is applied to a discussion of photomeson production in complex nuclei. 32 references. (auth)

2171

PROTON-PROTON SCATTERING AT INTERMEDIATE ENERGIES. André Martin and Loup Verlet. Phys. Rev. 89, 519-20(1953) Jan. 15.

Calculations were carried out to investigate proton-proton scattering at 18.3 and 32.0 Mev as a test of nucleon-nucleon interaction predicted by the pseudoscalar meson theory. A comparison of the angular distribution of the differential cross sections with that obtained experimentally shows excellent agreement at 18.3 Mev and a discrepancy of ~10 % at 32.0 Mev. It is proposed that the energy dependence of the potential starts to be felt at the higher energy or that the detailed structure of the interaction at short distances might become more significant. (L.M.T.)

2172

SCATTERING OF FAST ELECTRONS. PRELIMINARY NOTE. P. Urban and H. Mitter. Z. Naturforsch. a7, 818 (1952) Dec. (In German)

An expression for the differential cross section for almost elastic scattering of fast electrons by bare nuclei is derived in the general case (radiated quanta arbitrarily large) in the nonrelativistic approximation. (G.Y.)

2173

TEMPERATURE DEPENDENCE OF THE SCATTERING CROSS SECTION OF BOUND PROTONS FOR SLOW NEUTRONS. W. Guber. Z. Naturforsch. a7, 725-8(1952) Nov.

The scattering cross section of H_2 gas for thermal neutrons was measured as a function of the temperature of the H_2 between −55 and +208°C. The results are in good agreement with the theoretical calculations of Messiah (Phys. Rev. 84, 204(1951)). (tr-auth)

2174

IONIZATION AND ENERGY LOSS BY AN IONIZING RELATIVISTIC PARTICLE IN POLARIZABLE MATERIAL. P. Budini. Z. Naturforsch. a7, 722-5(1952) Nov. (In German)

The problem of the ionization produced by a relativistic ionizing particle is considered. It is shown that the ionization distribution at large collision parameters is not continuous with the theoretical distribution given by Bethe and Bloch for subatomic distances. Physical reasons are deduced for this discrepancy. A general equation for the specific primary ionization at large distances is derived. (tr-auth)

2175

THE ELECTRIC SCATTERING OF DEUTERONS. U. E. Kruse, N. F. Ramsey, and B. J. Malenka. Phys. Rev. 89, 655-6(1953) Feb. 1.

The conclusions presented in a letter by French and Goldberger (Phys. Rev. 87, 899(1952)) on the electric scattering of deuterons, and a letter on the same subject by N. F. Ramsey (Phys. Rev. 83, 659(1951)) are different in one respect because of the former authors' assumption of simple Rutherford scattering and Ramsey's prediction of a small departure from simple scattering. It is shown in the present paper that the discrepancy arises because the approximations used by French and Goldberger are just such as to conceal the non-Rutherford scattering arising from the distortion of the deuteron by the electric field. When this factor is taken into account, the disagreement with Ramsey's conclusions disappears. (L.T.W.)

RADIATION EFFECTS

2176

Brookhaven National Lab.

THE RADICAL YIELD RATIO OF IONIZING RADIATION IN FERROUS SULFATE AND CERIC SULFATE SOLUTIONS, by Everett R. Johnson. [nd] 12p. (BNL-1352)

Dilute aqueous solutions of ceric sulfate and ferrous sulfate in 0.8N H_2SO_4 were irradiated with hard x rays. Using the mechanism for the radiation-induced oxidation of ferrous sulfate solutions proposed by Rigg, Stein, and Weiss and the mechanism for radiation-induced reduction of ceric sulfate solutions proposed by Hardwick, values for the radical yield ratio $2G_f/(G_r + 2G_f)$ are obtained. These are 0.21 and 0.38, respectively, indicating that the two mechanisms are mutually incompatible. (cf. BNL-1209; NSA 6-5344) (auth)

2177

Massachusetts Inst. of Tech.

X-RAY STUDY OF RADIATION DAMAGE, by B. E. Warren. Dec. 31, 1952. 8p. (NYO-3732)

The development of x-ray diffraction methods for measuring and evaluating the nature of radiation damage in materials and the application of these methods to typical metals, alloys, and inorganic compounds are discussed. (J.E.D.)

2178

INVESTIGATION BY DIFFRACTION AND ELECTRON MICROSCOPY OF THE BEHAVIOR OF SILVER BROMIDE UNDER THE ACTION OF FAST ELECTRONS. Jean-Jacques Trillat. Compt. rend. 236, 60-2(1953) Jan. 5. (In French)

Electron microscopy, combined with electron diffraction, permits following the changes in AgBr when it is bombarded with a beam of electrons. It is also possible to differentiate clearly, in the same region, the presence and structure of the free Ag and of the initial bromide. (tr-auth)

2179

EFFECTS OF F CENTERS ON THE INTERNAL FRICTION OF ROCKSALT SINGLE CRYSTALS. D. R. Frankl and T. A. Read. Phys. Rev. 89, 663-4(1953) Feb. 1.

Mild x irradiation of rock salt single crystals produced a deep amber coloration throughout the crystal with some decrease of intensity in the direction of incidence. Milder irradiations of similar specimens gave less intense coloration extending partly through the crystal, and the consequent re-

duction of internal friction was smaller. Annealing for 30 min at 200°C, followed by slow cooling to room temperature, increased the internal friction nearly to its initial position. Irradiations of specimens at liquid N_2 temperature imparted only slight coloration to the crystal. On the lowering of the internal friction by irradiation, the Young's modulus increased by ~0.1%. It is proposed that free positive-ion vacancies diffuse to and interact with dislocations. The initial high damping is due to the motion of "loosely pinned" dislocations, and, on trapping the positive-ion vacancies, these dislocations become "firmly pinned." The binding energy of the pinning vacancies is small, since at slightly elevated temperatures they diffuse away and recombine with negative-ion vacancies. (L.T.W.)

2180

THE LATTICE EXPANSION OF QUARTZ DUE TO FAST NEUTRON BOMBARDMENT. M. Wittels. Phys. Rev. 89, 656-7(1953) Feb. 1.

The progressive anisotropic expansion of α quartz irradiated with increasing dosages of fast neutrons was measured. A total neutron flux of 6.6×10^{19} nvt resulted in a density change of $(\Delta\rho/\rho) \times 100 = 3.5 \pm 0.1$, as measured by the hydrostatic weighing method, and 4.8 ± 1.5 as measured by the x-ray method. The crystal temperature was approximately 100°C during irradiation. The expanded lattice belongs to the trigonal system. This lattice probably has the same space group as the unirradiated lattice. The expanded lattice constants are $a_0 = 5.01 \pm 0.01$ A and $c_0 = 5.41 \times 0.02$ A, as compared with the unirradiated quartz $a_0 = 4.90$ A and c = 5.39 A. The thermal stability of the expanded lattice is large; heating at 900°C for 12 hr contracted the lattice to normal parameters but heating at 485°C for 2 hr did not. (L.T.W.)

2181

SATURATION IN THE X-RAY COLORATION OF CORUNDUM SINGLE CRYSTALS. R. Allan Hunt and Robert H. Schuler. Phys. Rev. 89, 664(1953) Feb. 1.

X-ray coloration of Al_2O_3 single crystals shows that the characteristic absorption bands rapidly approach a low but constant saturation level, with additional irradiation having no appreciable effect on the coloration. At room temperature the coloration appears to be relatively stable. When heated for periods up to 24 hr at 1000°C, the crystals bleached to a blank identical to that of the unirradiated crystal. Heating at ~500°C produced a pinkish thermoluminescence. (L.T.W.)

RADIOACTIVITY

2182

Argonne National Lab.

THE DECAY OF Rh^{104m} (4.3 MIN.) AND Rh^{104} (44 SEC.), by W. C. Jordan, J. M. Cork, and S. B. Burson. Jan. 13, 1953. 11p. (AECU-2408; UAC-704)

The radiations of neutron-activated Rh were studied with 180° constant-field conversion-electron spectrometers and a γ-ray scintillation spectrometer. Internal-conversion electrons were observed to be associated with the 4.3-min activity. These are interpreted as arising from two isomeric transitions of 51.1 ± 0.2 and 77.2 ± 0.2 kev in Rh. By coincidence studies these two transitions are shown to be in cascade. The character of the radiation, as determined from the K/L ratio and lifetime considerations, appears to be M1 and E3, respectively. Additional γ rays of energy 550 ± 10 kev and ~1.2 Mev (weak) are observed with the scintillation spectrometer. The 550-kev transition is associated with both the 44-sec and the 4.3-min periods and is assumed to follow the β decay and hence be in Pd^{104}. (auth)

2183

Argonne National Lab.

ON THE ONE-BODY MODEL OF ALPHA RADIOACTIVITY. IIa. S-STATE DECAY WITH THE CONSISTENT SQUARE WELL MODEL, by G. H. Winslow and O. C. Simpson. Dec. 3, 1952. 30p. (ANL-4901)

The problem of α decay is considered when the interior potential is exactly a square well (the CSW model of Part I of this discussion (ANL-4841)) by examining the change with time of an initial nonstationary wave function. Although not required by the method, the problem is restricted to describe the emission of a single group of particles. The resulting necessary properties of the initial function are considered. Self-consistency is demonstrated by showing that two formally different expressions for the decay constant agree to $\sim 10^{-4}$%. It is found that the less general derivations given by Bethe and Preston are correct for the case considered; their expressions for the decay constant can be brought into agreement with that obtained here by the removal of numerical approximations from their derivations. A method for computing nuclear radii from the results obtained here is given, and some numerical comparisons are made. (auth)

2184

Ohio State Univ.

NUCLEAR THERMODYNAMICS OF THE HEAVIEST ELEMENTS, by Glenn T. Seaborg. Ohio State Univ. and Radiation Lab., Univ. of Calif., Berkeley. Mar. 1952. 16p. (UCRL-1942)

A study is made of the use of the radioactive, neutron binding, and mass spectrographic data for the calculation of the relative and absolute masses of the translated nuclides and the use of these in connection with the energy surface and general energetics of this region. (J.E.D.)

2185

ISOMERIC TRANSITIONS IN Tc^{93} AND Tc^{96}. Harry T. Easterday and Heinrich A. Medicus. Phys. Rev. 89, 752-4(1953) Feb. 15.

The 390-kev γ line reported to be associated with Tc^{92} is found to be Tc^{93} and is shown to be a M4 isomeric transition. Mass assignment to Tc^{96} is made for the isomeric transition previously known to have 34.4-kev energy and 51.5-min half life, and a weak positron branching was found. 13 references. (auth)

2186

THE MEASUREMENT AND INTERPRETATION OF THE K AUGER INTENSITIES OF Sn^{113}, Cs^{137}, AND Au^{198}. C. D. Broyles, D. A. Thomas, and S. K. Haynes. Phys. Rev. 89, 715-24(1953) Feb. 15.

Auger-electron intensity measurements have been made on Cs^{137}, Au^{198}, and Sn^{113} with a magnetic-lens spectrometer which is briefly described. K Auger yields for Ba and Hg of 0.130 ± 0.007 and 0.056 ± 0.008, respectively, were obtained. The K Auger electrons were resolved into three groups, K-LL, K-LX, and K-XY, according as two, one, or no L electrons were involved. The ratios of the intensities of the latter two to the K-LL were found to be for In 0.417 ± 0.016 and 0.076 ± 0.008; for Ba 0.40 ± 0.04 and 0.08 ± 0.02. The measured ratio of K-LX to K-LL for Hg was 0.71 ± 0.15. The relationship of these results to theory is discussed. A summary of measurements of K fluorescence yield and K Auger line intensity ratios is given. The Auger spectrum from Au^{198} indicates that K capture to Pt^{198} cannot occur in more than 0.5 percent of the disintegrations. A crude estimate of the L to K capture ratio for Sn^{113} indicates that it is not abnormally high. 45 references. (auth)

2187

RADIATIONS FROM ARSENIC 70. B. Verkerk and A. H. W. Aten, Jr. Physica 18, 974-5(1952) Nov.

Assignment of the 52-min As activity to As^{70} was confirmed by bombardment of As-free Ge oxide with 26-Mev deuterons. The half life found from a large number of observations is 52 ± 1 min. The maximum energy of the positron is 2.7 Mev

as determined by Al absorption measurements. An upper limit of 0.2 could be established for the K/β^+ ratio, in agreement with the theoretical value of 0.04 for this ratio. Hard γ rays were also present. The average energy of this radiation was determined to be about 1.3 Mev, and roughly two quanta of these hard γ rays were found per positron. (G.Y.)

2188
OBSERVATIONS ON NEUTRON-DEFICIENT RHODIUM ISOTOPES. A. H. W. Aten, Jr., H. Cerfontain, W. Dzcubas, and T. Hamerling. Physica 18, 972-3(1952) Nov.

A 9-min Rh isotope which emits positrons has been observed in appreciable strength in the Rh fraction obtained from Ru irradiated with 28-Mev deuterons. The 9-min period definitely does not arise from a (d,n) process. It may be due to Rh^{98} or Rh^{96} formed by a (d,2n) reaction, and it does not seem impossible that it should be due to a (d,3n) process. The latter alternative seems much less likely, because it has not been possible to obtain the 100-min β^+-period of Ru^{95} by milking the Rh fractions. However, the unknown but probably low value of the β^+/K ratio in Ru^{95} detracts from the value of this argument. (G.Y.)

2189
SOME REMARKS ABOUT THE DECAY OF ^{237}U. A. H. Wapstra, M. Sterk, and R. E. W. Kropveld. Physica 18, 980-1(1952) Nov.

A reinvestigation of the decay of U^{237} was discontinued on the appearance of the report by Wagner et al. (NSA 6-4981), but results already obtained are presented. The low-energy part of the scintillation spectrum, with three peaks at ~20, 60, and 97 kev, is shown. The lowest energy line is not simple; it consists almost entirely of Np L x rays originating from internal conversion (~17 kev) and a 27-kev component. (G.Y.)

2190
GAMMA-RADIATIONS FROM Zr^{95} AND Nb^{95}. C. E. Mandeville, E. Shapiro, R. I. Mendenhall, E. R. Zucker, and G. L. Conklin. Phys. Rev. 89, 559-61(1953) Feb. 1.

By employing lead absorption, coincidence-counting techniques, and scintillation spectrometry, it has been shown that each β ray of Nb^{95} is followed by a γ ray of energy 0.76 ± 0.02 Mev and that most of the β rays of the parent element Zr^{95} are followed by a single γ ray at 0.73 ± 0.02 Mev. A disintegration scheme is proposed. 15 references. (auth)

2191
THE HALF-LIFE OF W^{187}. G. G. Eichholz. Phys. Rev. 89, 525-6(1953) Jan. 15.

The half life of W^{187} was redetermined, the measurements being carried out by means of an A-filled ionization chamber, a vibrating-reed electrometer, and a pen recorder. The stability of the apparatus was previously described (Phys. Rev. 86, 794(1952)). Chemically pure $CaWO_4$ and W metal samples were irradiated for 1 day with slow neutrons and the decay of each sample was plotted over a period of 4 half lives, two different runs being carried out on both samples. The value determined was 23.85 ± 0.08 hrs. (L.M.T.)

2192
CROSS TERMS IN β-DECAY. O. Kofoed-Hansen and Aage Winther. Phys. Rev. 89, 526(1953) Jan. 15.

In the general expression developed for the β spectra by de Groot and Toihoek (Physica 16, 456(1950)), the most important effect of the cross term b/E is a change of the slope of the Kurie plot at low and medium maximum energies. This is seen from a plot which shows the maximum deviation of the curved Kurie plot from a straight line drawn through points 100 kev above zero energy and 100 kev below maximum energy for different values of the cross term coefficient b as a function of E_{max}. The effect of cross terms on the electron-neutrino angular correlation in recoil experiments is also considered. (L.M.T.)

2193
ESTIMATING EXPONENTIAL DECAY. Lawrence H. Krohn. Nucleonics 11, No. 2, 67-8(1953) Feb.

In radiation control work, an order-of-magnitude estimate of the decay of radioisotopes or of the attenuation of radiation by shielding materials will often suffice. But estimates based on 5 or more half lives or half thicknesses are almost as time consuming as calculating the exact solution. A method is described whereby tenth lives or tenth thicknesses are used, making it easy to associate specific times or thicknesses with the one-hundredth, one-thousandth, etc., values. The conversion equation is $T_{1/10} = 3.322\ T_{1/2}$. The method is illustrated by two examples. (L.T.W.)

2194
ASSIGNMENT TO THE ISOTOPE OF MASS 93 OF THE 6.7-HR ISOMERIC TRANSITION OF MOLYBDENUM. René Bernas and Jacqueline Beydon. Compt. rend. 236, 194-6(1953) Jan. 12. (In French)

Isotopic analysis of Mo obtained by bombardment of Nb_2O_5 with 6.7-Mev deuterons permitted definite assignment of the 6.7-hr isomeric transition to Mo^{93}. (tr-auth)

2195
DEGREE OF COHERENCE WITHIN A RADIOACTIVE DISTRIBUTION. Jean Thibaud. Compt. rend. 236, 66-8(1953) Jan. 5. (In French)

Systematic anomalies were observed in the distribution of intervals between α emissions by Po. When large numbers of combined lengths, Σ_m, of intervals taken m at a time were plotted, periodicities corresponding to certain multiples of the average interval were noted. (G.Y.)

2196
EVIDENCE FOR EMISSION OF ELECTRONS FROM THE ELECTRON CORTEGE OF AN ATOM SIMULTANEOUSLY WITH β RADIATION. Francis Suzor and Georges Charpak. Compt. rend. 236, 481-2(1953) Feb. 2. (In French)

Evidence is presented of 11 ± 1 cases in 1000 disintegrations of P^{32} in which an external electron was emitted in coincidence with the β particle. For Cl^{36}, the same phenomenon occurred in 11 ± 1 cases per 1000, and for RaE (Bi^{210}), in 6 ± 1 per 1000. These electrons apparently form a spectrum, the mean energy of which is about 30 to 40 kev in the three examples. (tr-auth)

2197
GAMMA RADIATION FROM THE $Sn^{113} \rightarrow In^{113}$ TRANSITION. Yvon Deschamps and Paul Avignon. Compt. rend. 236, 478-80(1953) Feb. 2. (In French)

A scintillation spectrometer was used to study the γ radiations of Sn^{113}. Although the 393-kev line reported by previous investigators stood out clearly, no photoelectric peak corresponding to the 255-kev line reported by Cork (NSA 6-739) was observed. The existence of a second γ ray near 400 kev and of one near 155 kev is suggested. (G.Y.)

SHIELDING

2198
Brookhaven National Lab.
FACILITIES FOR GAMMA RADIATION RESEARCH, by Bernard Manowitz. [Jan. 1953] 12p. (BNL-1341)

The design of Pb containers for effectively shielding the high-intensity Co^{60} and Ta^{182} γ sources during radiation experiments at Brookhaven National Lab. is discussed. For large-scale experimentation a γ irradiation drum has been designed for use under H_2O, the H_2O acting as a partial shield. A new H_2O pit recently constructed at Brookhaven is briefly described. (L.M.T.)

THEORETICAL PHYSICS

2199

Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro (Brazil)

NON RELATIVISTIC EQUATION FOR CHARGED PARTICLES WITH SPIN $^3/_2$, by J. Tiomno. Dec. 25, 1952. 10p. (NP-4380; Physics Note No. 9)

Recent use of the Rarita-Schwinger equation for spin $^3/_2$ to describe the μ meson makes it important to reexamine the equation in order to make further theoretical predictions that can be compared with those obtained under the assumption of spin $^1/_2$ or 0 for the μ meson. In the present paper, the nonrelativistic approximation of the Rarita-Schwinger equation for a charged spin-$^3/_2$ particle with mass $\underline{m}$ in an electromagnetic field is studied. To the approximation in which the derivatives of the field can be neglected it is found that the hamiltonian is of the usual form for a charged particle but with a magnetic dipole interaction term $(e/3\underline{m})(\tilde{H}\cdot\tilde{H})$, where $\tilde{H}$ is the magnetic field and $\tilde{M}$ the spin operator for a $^3/_2$-spin particle. The gyromagnetic factor thus is $^2/_3$, or the intrinsic magnetic moment of such particles (its higher eigenvalue) is $e/2m$. As this magnetic moment is the same as that for particles with spin $^1/_2$ or 1, it may be expected that the intrinsic magnetic moment of a particle with any spin is given by $e/2\underline{m}$. This surmise is being examined. (G.Y.)

2200

THEORY OF SCATTERING OF ELECTRONS ON ELECTRONS. H. Salecker. Z. Naturforsch. a8, 16-19(1953) Jan. (In German)

With the idea of testing experimentally the higher approximations of quantum electrodynamics with the help of electron-electron scattering, the modifications to this process resulting from the generalized field theory are investigated. In the first section, the general matrix element for an arbitrary structure function is derived. In the second section, the differential cross section for a special case is calculated, and the general cross section is constructed with its aid. In conclusion the deviations from Møller's equation that yield the modifications (in the "electron radius") in two different, optional magnitudes are discussed. It is shown thereby that the deviations under consideration can actually be observed, with a plausible magnitude taken for the modifications, if the energy of the incident particle exceeds 10^9 ev in the laboratory system. (tr-auth)

2201

THEORY OF ANGULAR CORRELATIONS. F. Coester and J. M. Jauch. Helv. Phys. Acta 26, 1-16(1953) Feb. 15. (In English)

The most general angular correlation function may be written in the form $W = Tr(\epsilon\rho)$, where ρ is the density matrix describing the ensemble of final nuclei and reaction products, and the "efficiency matrix" ϵ is completely determined by the counter arrangement and the nature of the particles to be counted. Expansion of ϵ and ρ into sums of irreducible tensors greatly simplifies the evaluation of the trace. Explicit general rules are derived for the construction of any angular correlation function from a few simple building stones. (auth)

2202

ON THE DIVERGENCE OF PERTURBATION THEORY FOR QUANTIZED FIELDS. Walter Thirring. Helv. Phys. Acta 26, 33-52(1953) Feb. 15. (In English)

The convergence of perturbation theory is investigated for a scalar field with an interaction term $\lambda\psi^5$. It is shown that for a certain energy region the series diverges for all values of λ. (auth)

2203

CERTAIN EXPLICIT RELATIONSHIPS BETWEEN PHASE SHIFT AND SCATTERING POTENTIAL. Norman Levinson. Phys. Rev. 89, 755-7(1953) Feb. 15.

An intuitive account is given of recent important results of Gelfand and Levitan for the determination of the potential in the one-dimensional Schroedinger equation from the S-phase shift, the bound states, and certain normalizing parameters. The method is then used to obtain the first variation in the potential corresponding to a small change in the phase shift, bound states, and normalizing parameters. (auth)

2204

THEORY OF ENERGY SPECTRA OF QUANTUM SYSTEMS OF MANY PARTICLES. V. L. Bonch-Bruevich. Doklady Akad. Nauk. S. S. S. R. 87, 711-14(1952) Dec. 11. (In Russian)

2205

NOTE ON THE NON-LOCAL INTERACTION. Naomi Shôno and Nobuo Oda. Progress Theoret. Phys. (Japan) 8, 28-38 (1952) July.

In order to construct the singularity-free classical electrodynamics, Bopp proposed to generalize the field equation and Peierls-McManus attempted the extension of the interaction. In this paper, the interrelations between these two theories from the quantum-theoretical point of view are investigated, and two special types of non-local interaction between electromagnetic field and an electron are proposed, with which the problem of the self-charge as well as the electron self-energy can be treated satisfactorily. (auth)

2206

ON THE THEORY OF THE GREEN-FUNCTIONS IN QUANTUM-ELECTRODYNAMICS. Ryôyu Utiyama, Sigenobu Sunakawa, and Tsutomu Imamura. Progress Theoret. Phys. (Japan) 8, 77-110(1952) July.

The re-formulation of Schwinger's theory of Green functions is carried out by making use of Tomonaga-Schwinger theory. The physical meaning of several quantities and the relations between Green functions and the S matrix are clarified. The general rule for obtaining the Green functions of many-body problems is derived. The removability of divergences arising in the Green function of the one-body problem is proved. Ward's identity is derived from the gage covariance of Green functions. (auth)

2207

ON THE QUANTUM AND CLASSICAL PROBLEM OF IRREVERSIBILITY. Olivier Costa de Beauregard. Compt. rend. 236, 277-9(1953) Jan. 19. (In French)

The symmetry of quantum prediction and retroduction and the objectivity of macroscopic irreversibility are discussed. (G.Y.)

2208

THREE-NUCLEON INTERACTIONS IN YUKAWA THEORY. G. Wentzel. Phys. Rev. 89, 684-8(1953) Feb. 15.

The method of Salpeter and Bethe (Phys. Rev. 84, 1232 (1951)) is applied to the three-nucleon bound-state problem. In a first approximation involving only multiple ladder-type diagrams, and neglecting retardation effects altogether, an equivalent hamiltonian is derived which contains as potential energy merely the static Yukawa potentials of the three-nucleon pairs. If the retardation corrections are treated as small perturbations, e.g., in a scalar theory, the resulting three-particle interactions prove to be small of the second order, and no larger than those deriving from other classes of Feynman diagrams. The static solution of the four-particle problem and the first-order retardation correction to the two-body potentials for scalar theories are given. (auth)

2209
ANGULAR MOMENT AND PARITY OF SYSTEMS COMPOSED OF TWO IDENTICAL BOSONS OF ZERO MASS. Georges Bonnevay and Louis Michel. Compt. rend. 236, 461-2(1953) Feb. 2. (In French)

The results of Landau on two-photon systems are generalized to bosons of zero mass and spin S. In the Lorentz system for which the total momentum is zero, two such bosons cannot form a system for which the total angular momentum J is odd and <2S nor in which J is odd and the parity is odd. (tr-auth)

2210
CALCULATION OF THE CROSS SECTION FOR BREMSSTRAHLUNG EMISSION BY A SPIN-$^1/_2$ PARTICLE INTERACTING WITH A SPIN-$^n/_2$ PARTICLE (n INTEGRAL). Gérard Petiau. Compt. rend. 236, 462-4(1953) Feb. 2. (In French)

A covariant calculation of the cross section for bremsstrahlung emission by a charged spin-$^1/_2$ particle in coulomb interaction with a spin-$^n/_2$ particle is presented which is represented by the solutions of irreducible wave equations from the theory of particles of arbitrary spin previously proposed by the author. (tr-auth)

2211
RADIATIVE CORRECTION TO β-DECAY MATRIX ELEMENT. S. Kamefuchi. Progress Theoret. Phys. (Japan) 8, 137-8(1952) July.

The radiative correction to the interaction of electromagnetic or meson fields with spinor fields was discussed by Nakano, et al. (Progress Theoret. Phys. (Japan) 5, 1014(1950)) in the lowest-order approximation. The present paper considers the radiative correction to the interaction more generally for higher-order corrections. It is concluded that the divergences in the interaction are renormalizable. (L.T.W.)

2212
ON THE UNIVERSAL FERMI-TYPE INTERACTION. III. E. R. Caianiello. Nuovo cimento (9) 10, 43-53(1953) Jan. 1. (In English)

An analysis is made of the symmetry requirements that can be imposed upon a linear combination of the odd couplings used in I (NSA 6-4923) and II (NSA 6-4999) to study the possibility of a universal Fermi-type interaction. A unique criterion results if one takes into account some well-established experimental facts and makes the assumption that the universal interaction has the same form for all processes. The remaining ambiguity between the different modes still allowed by this criterion to the various processes can be removed by further assuming that some rule exists to discriminate among them. Two alternatives then result which lead to different shapes of the muon spectrum. A final decision depends, therefore, on the precise knowledge of this spectrum. Both alternatives compare favorably for β decay with all the experimental evidence thus far. (auth)

2213
RELATIVISTIC QUANTUM DYNAMICS OF A SYSTEM OF INTERACTING PARTICLES. J. Rzewuski. Nuovo cimento (9) 10, 90-3(1953) Jan. 1. (In English)

Construction of an S-matrix for relativistic dynamics of interacting particles is described briefly. (G.Y.)

2214
STATISTICAL INVESTIGATION OF THE FUNDAMENTAL PROCESSES IN THE QUANTUM THEORY OF ELEMENTARY PARTICLES. Fritz Bopp. Z. Naturforsch. a8, 6-13(1953) Jan. (In German)

The fundamental process of the quantum theory of particles, the production or annihilation of a particle at a point, is analyzed by elementary statistics and by quantum statistics. It is shown that any combination of fundamental processes can be handled by elementary statistics, if certain conditions are observed. From these it follows that elementary statistics are applicable to irreversible processes, whereas quantum-statistical processes are reversible. (tr-auth)

URANIUM AND URANIUM COMPOUNDS

2215
THE MAGNETIC SUSCEPTIBILITY OF URANIA–THORIA SOLID SOLUTIONS. J. K. Dawson and M. W. Lister. J. Chem. Soc., 5041-2(1952) Dec.

Magnetic-susceptibility measurements on the UO_2-ThO_2 system were found to be in good agreement with those of Trzebiatowski and Selwood (NSA 5-816), although the solid solutions were prepared by a different method. Extrapolation of the magnetic moment to infinite dilution gives ~3.0 Bohr magnetons, close to the spin-only coupling value and implying a $6d^2$ electron configuration for quadrivalent U. (G.Y.)

AUTHOR INDEX

For each reference the digit preceding the dash is the volume number and digits after the dash are the abstract number.

AARTS A J J
7-2014
ABD-EL HALIM F M
7-1920 7-1921
ABELE R K
7-2049
ABKOWITZ STANLEY
7-1997
AGENO M
7-2065
AHRENS L H
7-2040
AITKEN I D
7-1914
ALDRICH L T
7-2040
ALFRED UNIV
7-1940
ALLEN BENNET M
7-1872
ALLEN C M
7-1986
AMES LAB
7-2097
ANTHONY JEAN-PIERRE
7-2074
APPLIED SCIENCE RESEARCH
LAB UNIV OF CINCINNATI
7-1973
ARGONNE NATIONAL LAB
7-1911 7-1922 7-1923
7-1924 7-1936 7-1947
7-1954 7-1956 7-1970
7-1971 7-2050 7-2051
7-2052 7-2116 7-2117
7-2182 7-2183
ARMY MEDICAL RESEARCH
LAB FORT KNOX
7-1868
ARNOTT D G
7-1910
ATEN A H W JR
7-2187 7-2188
ATOMIC ENERGY PROJECT
UNIV OF CALIF
LOS ANGELES
7-1865 7-1872
ATOMIC ENERGY RESEARCH
ESTABLISHMENT HARWELL
BERKS ENGLAND
7-1914 7-1987 7-2008
7-2018 7-2028
ATTIX FRANK H
7-2057
AVIGNON PAUL
7-2197
AYANT YVES
7-2134

BABCOCK AND WILCOX CO
7-1975
BAINBRIDGE KENNETH T
7-2120
BAIR J K
7-2126
BAKER R G
7-2071
BAKER WILLIAM K
7-1883
BALL CHARLES D
7-1959
BALLINI R
7-2068
BALLOU JOHN E
7-1908
BANDTEL KENNETH C
7-2156
BARENDSEN G W
7-2064
BARFORD N C
7-2080
BARLOW G B
7-1937
BARNEVELD W
7-2079
BARRETT J C
7-1995
BARRETT PAUL H
7-2015
BARRETT THOMAS F
7-1907
BARRON E S GUZMAN
7-1874 7-1875 7-1876
BARTON R
7-2100
BATTELLE MEMORIAL INST
7-1986 7-1988 7-1996
BAUER FRANZ K
7-1907
BEATTY ALVIN V
7-1878 7-1890
BECKETT C W
7-1994
BELL J S
7-2161
BELL P R
7-2030
BELLIBONI G
7-2017
BENDT PHILLIP J
7-2169
BENNETT EDWARD L
7-1957
BENNETT LESLIE R
7-1865
BENNETT WINIFRED
7-1858
BERNARD MICHEL YVES
7-2025
BERNAU RENE
7-2042 7-2194
BERRY C E
7-2048
BERSTEIN IRVING A
7-1958
BERTHELOT A
7-2068
BEVAN D J M
7-2008
BEYDON JACQUELINE
7-2194
BIOLOGICAL LABS
HARVARD UNIV
7-1905
BIOPHYSICAL LAB
HARVARD MEDICAL SCHOOL
7-1905
BLATT J M
7-2112
BLAU MONTE
7-1913
BLOCH F
7-2107
BLOK J
7-2166 7-2167
BOEKER G F
7-1974
BOGART LOUIS
7-2059
BONCH-BRUEVICH V L
7-2204
BOND V P
7-1873
BONINO J J
7-2041
BONNEVAY GEORGES
7-2209
BOPP FRITZ
7-2214
BOSTOCK W
7-1969
BOULANGER F
7-1952
BOWELL E
7-2135
BRACCI A
7-2086 7-2143
BRADLEY D C
7-1919 7-1920 7-1921
BRANDAO F A S A
7-1925
BRAVO JUSTO B
7-1917
BREITLING GERHARD
7-2083
BRENNER P
7-2001
BRESLIN A J
7-1895
BRETONNEAU PIERRE
7-2070
BRIERE M
7-2034
BROOKHAVEN NATIONAL LAB
7-1857 7-1965 7-1972
7-1989 7-2118 7-2119
7-2120 7-2121 7-2176
7-2198
BROYLES C D
7-2186
BRUCER MARSHALL
7-2031
BRUECKNER K A
7-2163
BUDINI P
7-2174 7-2174
BUESS R
7-2043
BUNTON C A
7-1960
BUREAU OF MINES
COLLEGE PARK MD
7-1995
BURG ANTON B
7-1915
BURSON S B
7-2182
BUSSO R H
7-1943
BYERRUM RICHARD U
7-1959

CAIANIELLO E R
7-2212
CAIRD R S
7-2147
CALIFORNIA INST OF TECH
7-2026
CALVIN M
7-1906
CAMPBELL DONALD J
7-1902 7-1903
CANCER RESEARCH INST
NEW ENGLAND DEACONESS
HOSPITAL BOSTON
7-1864
CARLBOM L
7-2076
CARLSON R R
7-2126
CARTER R E
7-1869
CARTTAR MAGDALENE S
7-1881
CARVER J H
7-2155
CASSELS J M
7-2028
CASSEN BENEDICT
7-1907
CASSIGNOL CH
7-2044
CASSON HARVEY
7-2141
CECIL OLIN B
7-1918
CENTRO BRASILEIRO DE
PESQUISAS FISICAS
RIO DE JANEIRO BRAZIL
7-1925 7-2060 7-2199
CERFONTAIN H
7-2188
CHALLANDE RENE
7-1968
CHAMBERS F W JR
7-2058
CHAMPEIX ROBERT
7-2062
CHARETTE J
7-1933
CHARPAK GEORGES
7-2196
CHASTEL RAYMOND
7-2154

CHEMICAL LAB
UNIV OF KANSAS
7-1917
CHEMLA MARIUS
7-1961
CHEW GEOFFREY F
7-2109
CHIAROTTI G
7-2133
CHICAGO UNIV
7-1916
CHRISTENSEN WILLIAM R
7-1891
CHRISTY R F
7-2140
CHYLE J J
7-2005
CLAY J
7-2014
CLEMENT J
7-2062
COCCONI G
7-2015
COESTER F
7-2201
COFFIN L F JR
7-2029
COLE L J
7-1873
COLE T E
7-2138
COLUMBIA UNIV
SCHOOL OF ENGINEERING
7-1974
CONGDON CHARLES
7-1899
CONKLIN G L
7-2190
CONNER J P
7-2165
COOK C F
7-2124
COPPENS R
7-1985
COPSON H R
7-2006
CORK J M
7-2182
CORRY R T
7-1974
CORTELLESSA T
7-2065
COSTA DE BEAUREGARD
OLIVIER
7-2207
COURTOY CH
7-1934
COX F G
7-2007
COX J D
7-1932
CRAIGHEAD C M
7-1996
CROUTHAMEL C E
7-1924
CRYOGENIC LAB
OHIO STATE UNIV
7-1994
CUER PIERRE
7-2066
CUNNINGHAM B B
7-1962

DAAMS H
7-2084
DAHM PAUL A
7-1904
DARDEN SPERRY
7-2123
DAUBRY DE PUYMORIN R
7-2103
DAUDEL RAYMOND
7-2111
DAVIDSON J P
7-2106
DAVIS CARL B JR
7-1903
DAWSON J K
7-2215
DAY FRANK H
7-2055
DAYTON IRVING E
7-2130
DAYTON R W
7-1986
DE BROUCKERE L
7-2043
DEACON E L
7-2098
DELANEY C F G
7-2125
DE LAUNAY JULES
7-2019
DELFOSSE J M
7-2046
DE MEVERGNIE M NEVE
7-2048
DENSON JACK R
7-1868
DEPARTMENT OF MINES AND
TECHNICAL SURVEYS
CANADA
7-1984
DESCHAMPS YVON
7-2197
DE VRIES HL
7-2064
DEWDNEY JOHN W
7-2045
DEWEY LOVELL J
7-1959
DICKSON J M
7-2028
DIENES G J
7-1972 7-1989
DOBBINS WILLIAM E
7-1966
DOLLEY P
7-2028
DORMONT HENRI
7-2062
DORN JOHN E
7-1992
DOWNES K W
7-2118
DOYLE BARBARA
7-1879
DRESEL E M
7-1942
DUCKWORTH HENRY E
7-2045
DUMOND JESSE W M
7-2059
DUPLAN JEAN FRANCOIS
7-1888
DURAND EMILE
7-2021 7-2024
DURANDEAU PIERRE
7-2023
DURBIN RICHARD P
7-2142
DZCUBAS W
7-2188

EASTERDAY HARRY T
7-2185
EATHERLY W P
7-1946
EBERTS W U
7-1986
EDGE R D
7-2155
EDINGTON CHARLES W
7-1883
EDWARDS GAIL P
7-1966
EHRENREICH RICHARD
7-1966
EHRLICH MARGARETE
7-2053
EICHHOLZ G G
7-2191
EISENBERG Y
7-2015
EISENSTADT R
7-1974
ELLINGER FRIEDRICH
7-1871
ELLIOTT R J
7-1963
ELMENDORF R A
7-2056
ELROD H G
7-1975
EL-WAHAB KHALIL M ABD
7-2013

FACCHINI U
7-2143
FARMER EARLE C
7-1958
FAVRE R
7-2078
FEENBERG E
7-2106
FELD BERNARD T
7-2108
FELDMAN DAVID
7-2122
FERRARI F
7-2113
FERRETTI RENATO J
7-1929
FIELDS MELVIN
7-1958
FILLERUP DOROTHY L
7-1865
FINKELSTEIN P
7-1876
FISHLER M C
7-1873
FLOKSTRA JOHN H
7-1959
FLOOD VERONICA
7-1875
FLORESCU N A
7-1979
FORD F C
7-2068
FOUSE R R
7-1975
FOX R E
7-2047
FRANCHI M
7-1897
FRANCIS J E
7-2030
FRANCK E U
7-1938
FRANK WILSON J
7-2156
FRANKEL S
7-2101
FRANKL D R
7-2179
FRECHETTE V D
7-1940
FREDIANI HAROLD A
7-1950
FREMLIN J H
7-1976 7-2157
FRIEMAN E A
7-2012
FROTA-PESSOA ELISA
7-1925
FRY W E
7-1892
FUJIMURA JUN
7-2145
FUKUDA H
7-2089
FULLER D D
7-1974
FURCHNER JOHN
7-1870

GALLONE S
7-2105
GAMBA A
7-2152
GATTI E
7-2160
GEBERT ELIZABETH
7-1956
GEIGER JAMES S
7-2045
GEOLOGICAL SURVEY
7-1982
GERICKE S
7-1887
GEYER JOHN C
7-1909
GIEDT WARREN H
7-1992
GILBERT F C
7-2088
GILES NORMAN H JR
7-1878 7-1890
GIULOTTO L
7-2133
GOLDHABER M
7-2119
GOODELL WARREN F JR
7-2142
GOODMAN RAYMOND D
7-1865
GOODWIN WILLIAM E
7-1907
GORDON SHEFFIELD
7-2050
GOULD R GORDON
7-1902 7-1903
GOULDING F S
7-2077
GRAY ELIZABETH J
7-1868
GRAY JOHN L
7-1868
GREGORY JAMES
7-1894
GRISWOLD ERNEST
7-1917
GUBER W
7-2173
GUNDLACH J
7-2049
GUNNILL O
7-2028

HACKERMAN NORMAN
7-1918

HAENNY CH
7-2078
HAGERMAN JOANNE S
7-1902
HALEVI E A
7-1960
HALL L G
7-2048
HALL W H
7-2081
HAMERLING T
7-2188
HAMERMESH BERNARD
7-2116 7-2117
HANLE W
7-2067
HARRIS PAYNE S
7-1870
HARRIS W B
7-1895
HART EDWIN J
7-2050
HARVARD MEDICAL SCHOOL
7-1864
HASLAM R N H
7-1882
HATCH L P
7-1965
HAVENS WILLIAM W JR
7-2142
HAVINGA E
7-1906
HAYNES S K
7-2186
HAYWARD HUGH R
7-1861
HEIN RICHARD E
7-1904
HELLSTRAND E
7-2159
HENGST K
7-2067
HENKEL RICHARD L
7-2115
HERBERT FRANK J
7-1868
HERZOG L F
7-2040
HICKAM W M
7-2047
HIDALGO J U
7-2072
HILL S S
7-1914
HOCHWALT CARROLL A
7-2137
HOECKER FRANK E
7-1863
HOFSTADTER ROBERT
7-2148
HOGG BENJAMIN G
7-2045
HOLDEN F R
7-1948
HOLT J R
7-2136
HOLYK W K
7-2040
HORSLEY R J
7-1882
HUBBARD H M
7-1924
HUBER R W
7-1995
HUNT R ALLAN
7-2181
HUTCHINSON G W
7-2032

ILLINOIS UNIV
ENGINEERING EXPERIMENT STATION
7-2011
IMAMURA TSUTOMU
7-2206
INOUE KENZ
7-2095
INOUE TAKEO
7-2095
INSTITUTE FOR ATOMIC RESEARCH
IOWA STATE COLL
7-2097
INSTITUTE OF ENGINEERING RESEARCH UNIV OF CALIF BERKELEY
7-1992
ISHIBASHI KOICHI
7-1901
ISTOCK J T
7-2058

JAFFEE R I
7-1996
JAUCH J M
7-2201
JECH CESTMIR
7-2063
JENS W H
7-1971
JENSEN N
7-1861
JENSEN P G
7-2075
JOHNS H E
7-1882
JOHNSON EVERETT R
7-2176
JOHNSON L V
7-1939
JOHNSON N R
7-2149
JOHNSON PHYLLIS
7-1874
JOHNSTON H L
7-1994
JONGEN H F
7-2014
JONKER C C
7-2166 7-2167
JORDAN W C
7-2182

KAMEFUCHI S
7-2211
KANSAS AGRICULTURAL EXPERIMENT STATION
7-1904
KANSAS UNIV
7-1863
KANSAS UNIV
SCHOOL OF MEDICINE
7-1858 7-1859 7-1860
7-1867
KANTZ ASHER
7-2148
KATZ L
7-2071
KATZIN LEONARD I
7-1956
KAYAN C F
7-1974
KAYAS M G
7-1949
KEDZIE CHEMICAL LAB
MICH STATE COLL
7-1959
KELLY FRANK B JR
7-1903
KIMBALL CLYDE
7-2116
KING J C
7-1866
KINGTON J D
7-2126
KIP A F
7-2100
KISIELESKI WALTER E
7-1947
KITTEL C
7-2100
KJELDAAS T JR
7-2047
KLEINBERG JACOB
7-1917
KNAPP W J
7-2003
KNOLLS ATOMIC POWER LAB
7-2029
KOCH C W
7-1962
KOFOED-HANSEN O
7-2192
KOHL JAMES L
7-2059
KOTANI TSUNEYUKI
7-2102
KRAEMER H F
7-2011
KRAUS GERARD
7-1973
KRAUSHAAR J J
7-2120
KROHN LAWRENCE H
7-2193
KROPVELD R E W
7-2189
KRUSE U E
7-2175
KUHLMANN WILSDORF DORIS
7-1998
KUTUCHIEF I
7-2005

LACASSAGNE ANTOINE
7-1898
LADU M
7-2144
LAING K M
7-2041
LAMARQUE PAUL
7-1884
LAMBERT JACK L
7-1927
LANDAU PIERRE
7-1889
LANE I R JR
7-1995
LAPOINTE C M
7-1984
LAPSLEY ALWYN C
7-2051
LARAN ROY
7-1912
LEDDICOTTE G W
7-1926
LEDERER MICHAEL
7-1955
LEITER HARRY
7-2031
LENNING G A
7-1996
LEPPERT GEORGE
7-1970
LESCHI JEANNE
7-1889
LEUBA PIERRE
7-2074
LEVINSON NORMAN
7-2203
LEW HIN
7-2127
LIBBY RAYMOND L
7-1907
LILLEY H
7-1978
LINDENFELD P
7-2096
LISTER M W
7-2215
LIU Y C
7-1993
LLEWELLYN D R
7-1960
LLOYD J T
7-1935
LOAR HOWARD H
7-2142
LOCKETT E E
7-2135
LOFTUS T P
7-2054 7-2056
LONCHAMP JEAN-PIERRE
7-2066
LORENZ EGON
7-1899
LOS ALAMOS SCIENTIFIC LAB
7-1869 7-1870 7-210
7-2115
LOTTES P A
7-1971
LOURAU MARGUERITE
7-1893
LOVATI A
7-2016
LUSHBAUGH C C
7-1900
LYNCH V
7-1906

MCCLELLAND J D
7-1946
MCCUSKER C B A
7-2153
MACDONALD J ROSS
7-1911
MCFARLAND ROBERT H
7-1904
MACHIS ALFRED
7-1909
MCKEE RALPH W
7-1864
MCOMIE J F W
7-1951
MADEY RICHARD
7-2156
MAIRE J
7-1945
MALENKA B J
7-2175
MALVICINI A
7-2143
MANDEVILLE C E
7-2190

MANNEBACK C
7-1933
MANOWITZ BERNARD
7-2198
MARGEM NEUSA
7-1925
MARGOLIN H
7-1953
MARGUIN GEORGES
7-2073
MARSH J K
7-1953
MARSHAM T N
7-2136
MARTIN ANDRE
7-2171
MARTIN CHARLES
7-2094
MASSACHUSETTS INST OF TECH
7-2177
MATHIEU-SICAUD A
7-1945
MATOSSI FRANK
7-2035
MATSUYAMA S
7-2092
MATZKO J J
7-1982
MAZZANTI L
7-1897
MEAD JAMES F
7-1865
MEDICUS HEINRICH A
7-2185
MEGHREBLIAN ROBERT VARTAN
7-2026
MEHROTRA R C
7-1919 7-1920 7-1921
MEINKE W WAYNE
7-2139
MEIXNER JOSEF
7-2027
MELLOR G A
7-2000
MENDENHALL R I
7-2190
METALLURGICAL ADVISORY COMMITTEE ON TITANIUM
7-1997
METALLURGICAL LABS DOW CHEMICAL CO
7-1990
METCALFE G J
7-2001
MICHEL LOUIS
7-2209
MICHIGAN UNIV
7-2139
MILAZZO GIULIO
7-1950
MILLARD MARY JANE
7-1872
MILLER MIKE A
7-2004
MILLER RUSSELL F
7-1930
MITCHELL ALLAN C G
7-2147
MITTER H
7-2172
MIYAZAWA H
7-2092
MOLE R H
7-1880
MOORE THOMAS E
7-1912
MOREAU JEAN
7-2070
MORGAN J E
7-2058
MORILLEAU EMILE
7-2062
MORTIMORE D M
7-1928
MOTZ L
7-2012
MULLER DAVID E
7-2059
MUNSON R J
7-1880
MURA A
7-2016
MURPHY P C
7-2002
MUTO TOSHINOSUKE
7-2095

NADLER S B
7-2072
NAGAHARA YUKIO
7-2145
NAKANO TADAO
7-2093
NAKANO YOSHIHIRO
7-2168
NASH G J C
7-1914
NATIONAL BUREAU OF STANDARDS
7-2053
NATIONAL RESEARCH COUNCIL DIV OF GEOLOGY AND GEOGRAPHY
7-1983
NAVAL MEDICAL RESEARCH INST BETHESDA
7-1871 7-2058
NAVAL ORDNANCE LAB
7-2058
NAVAL RADIOLOGICAL DEFENSE LAB
7-1873 7-2061
NAVAL RESEARCH LAB
7-2019
NEARY G J
7-1880
NELSON E
7-2101
NERESON NORRIS
7-2123
NEW YORK UNIV
7-1966 7-1993
NIDAY J B
7-2151
NIESET R T
7-2072
NISHIJIMA KAZUHIKO
7-2093
NOBLE L A
7-1928
NORMAN BRIDGE LAB OF PHYSICS CALIF INST OF TECH
7-2059
NORRIS L
7-1906
NORTH AMERICAN AVIATION INC
7-1991
NUDELMAN SOL
7-2035

OAK RIDGE NATIONAL LAB
7-2009 7-2030 7-2049
OBERLIN COLL
7-1861
OCHS LEONHARD
7-1964
OCONNOR D T
7-2058
ODA NOBUO
7-2205
OHIO STATE UNIV
7-2184

PANOFSKY H A
7-2098 7-2099
PARASOL MATTHEW
7-2097
PAUTHENIER MARCEL
7-1965
PEREZ WALDIR
7-1925
PERONA G
7-2160
PERRY K E G
7-2077
PERSANO A
7-2160
PESTEIL P
7-2082
PETIAU GERARD
7-2210
PHILLIPS PAUL H
7-1930
PICHAT L
7-2082
PIERRE-LEHMAN M
7-1885
PILEY HERBERT PARKES
7-1890
PIRONNEAU YVES
7-1999
POLLARD F H
7-1951
POLLARD WILLIAM G
7-2031
POOLE J H J
7-2125
PORTIS A M
7-2100
POUND R V
7-2132
POWERS PHILIP N
7-2137
PRAST G JR
7-2085
PRATT P L
7-1987 7-2018
PRESBYTERIAN HOSPITAL CHICAGO
7-1862 7-1902 7-1903
PRESENZ C S
7-1967
PRICE G A
7-2118
PRICE GEORGE R
7-1929
PRIGOGINE I
7-2043
PUGH S F
7-1987 7-2018

QUERZOLI R
7-2065

RAAEN VERNON F
7-1931
RADIATION LAB UNIV OF CALIF BERKELEY
7-1906 7-1957 7-1962
7-1967 7-2086 7-2156
7-2164
RADIATION PHYSICS LAB NATIONAL BUREAU OF STANDARDS
7-2054 7-2055 7-2056
7-2057
RAMSEY NORMAN F
7-2129 7-2175
RANZ W E
7-2011
READ T A
7-2179
REJSKOVA MARIE
7-1896
REMELY G R
7-1988
RESEARCH FOUNDATION OKLA AGRICULTURAL AND MECHANICAL COLL
7-1912
RESENDE FLAVIO
7-1886
REYNOLDS S A
7-1926
RIDDIFORD L
7-1978
RIDLEY R W
7-2000
RILEY HERBERT PARKES
7-1878
RINGO G R
7-2117
ROBERTS A
7-2087
ROBERTS L E J
7-1942
ROCHESTER UNIV
7-2087 7-2122
ROESLER F C
7-2153
ROPP GUS A
7-1931
ROSENBLUM SALOMON
7-2114
ROSS JOHN
7-1973
RUSSELL ALLEN S
7-2004
RYSHKEWITCH EUGENE
7-1981
RZEWUSKI J
7-2213

SACHS A
7-2096
SAILOR V L
7-2121
SALECKER H
7-2200
SALLER H A
7-1986
SALTER D C
7-2028
SALVETTI C
7-2105
SANDERS P
7-1900

SANDERS PHYLLIS
7-1869 7-1870
SCARF HERBERT
7-2031
SCHAEFFER RILEY
7-1916
SCHJEIDE OLE ARNE
7-1872
SCHLESINGER H I
7-1916
SCHMELZER CHRISTOPH
7-2158
SCHNEIDER H
7-2067
SCHOFIELD H ZANE
7-1980
SCHOTT G L
7-2139
SCHULER ROBERT H
7-2181
SCHWARTZ SAMUEL
7-1929
SCHWARZ HELMUT
7-2060
SCOTT GEORGE T
7-1861
SEABORG GLENN T
7-2184
SEELIGER R
7-2020
SEKI LOUISE
7-1874
SEPTIER ALBERT
7-2022
SETLOW RICHARD
7-1879
SETTI R LEVI
7-2090
SHAPIRO E
7-2190
SHELINE R K
7-2149
SHER R
7-2118
SHERBY OLEG D
7-1992
SHEWCHUCK SERGEY
7-2088
SHONO NAOMI
7-2091 7-2205
SIMPSON O C
7-2183
SKINNER G B
7-1994
SKOW R K
7-1948
SLAWSON C B
7-1944
SMITH F
7-1939
SMITH J R
7-2124
SMITH J R W
7-1977
SOLOMON A K
7-1905
SOLOWAY SIDNEY
7-1905
SOMMERS SHELDON C
7-1891
SPALDING CHARLES K
7-1891
SPEDDING F H
7-2100
SPERRY ALBERT B
7-2033
STACEY M
7-1939
STACY J T
7-1988
STEIN LAWRENCE
7-1936
STEINBERGER J
7-2096
STERK M
7-2189
STEVENS H M
7-1951
STOBER W
7-1938
STORER JOHN B
7-1870 7-1881 7-1900
STOWELL ROBERT E
7-1856 7-1859 7-1860
7-1867
STRAIN H H
7-1954
STRASSMANN FRITZ
7-1964
SUCCI C
7-2016
SUGARMAN NATHAN
7-2146
SUNAKAWA SIGENOBU
7-2206
SURYAN G
7-2131
SUTHERLAND W H
7-2036
SUZOR FRANCIS
7-2196
SWANSON DON R
7-2164

TAGLIAFERRI G
7-2016
TAKEBE HISAO
7-2102
TANIFUJI MAKOTO
7-2095
TAO YUNG
7-1940
TAYLOW J C
7-1937 7-1939
TAYLOR C
7-2076 7-2159
TAYLOR C BRUCE
7-1902 7-1903
TECHNICAL INFORMATION
SERVICE ABC
7-2010
TENNENT R M
7-2080
TEW JOHN T
7-1868
TEXAS UNIV
7-1918
THIBAUD JEAN
7-2195
THIRRING WALTER
7-2202
THOMAS D A
7-2186
THOMPSON ROY C
7-1908
THOMSON JOHN F
7-1881
TING YU
7-2128
TINLOT J
7-2087
TIOMNO J
7-2199
TITTERTON E W
7-2079
TOCHILIN E
7-2061
TODD J
7-1948
TOMASINI G
7-2090
TOMPKINS ALTHEA
7-2151
TOURTELLOTTE WALLACE W
7-1881
TRILLAT JEAN-JACQUES
7-2178
TSUBOI KENNETH K
7-1858 7-1859 7-1860
TUBIANA MAURICE
7-1889
TUCHMANN DUPLESSIS
HERBERT
7-1898
TUCKER G E G
7-2002
TURKEVICH A
7-2151

UECKER DONALD F
7-1947
UMEZAWA MINORU
7-2102
UNIVERSITY OF SOUTHERN
CALIF
7-1915
UPHOFF DELTA
7-1899
URBAN P
7-2172
UTIYAMA RYOYU
7-2206

VALADARES MANUEL
7-2114
VANECHO J A
7-1988
VAN ZOONEN D
7-2085
VERKERK B
7-2187
VERLET LOUP
7-2171
VILLI C
7-2113
VITALE B
7-2017
VIVIEN JEAN
7-1877
VOGEL RICHARD C
7-1936
VON DARDEL G
7-2159

WALKER D
7-2157
WALLACE BRUCE
7-1866
WALSH V J
7-2118
WANGSNESS R K
7-2107
WAPSTRA A H
7-2189
WARD A H
7-2075
WARDLAW W
7-1919 7-1920 7-1921
WARNER IRVING
7-1902
WARREN B E
7-2177
WASHBURN H W
7-2048
WATAGHIN V
7-2152
WATKINS G D
7-2132
WATSON KENNETH M
7-2170
WEILL J
7-2034
WEINBERG IZABELLA GOLDIN
7-2112
WELLS-COLE J
7-1910
WELLS F H
7-2038
WELSH J H
7-1905
WENT J J
7-2069
WENTZEL G
7-2208
WERKING L C
7-1941
WERLE J
7-2110
WERNHOLM O
7-2162
WESLEY R P
7-2029
WEST R
7-2039
WEST W S
7-1982
WEXLER S
7-2117
WHITE M G
7-1982
WHITING F B
7-2040
WILKINSON D H
7-2155
WILKINSON PAUL N
7-1863
WILLARD H B
7-2126
WILLARD JOHN E
7-1913
WILLIAMS DUDLEY
7-2128
WILLIAMS ROBERT E
7-1912
WILLIAMSON E M
7-2104
WILLIAMSON G K
7-2081
WILMOT R D
7-1984
WILSDORF HEINZ
7-1998
WILSON ELIZABETH D
7-2120
WILSON MARGARET E
7-1856 7-1859 7-1860
7-1867
WILTS JAMES R
7-2059
WINSLOW G H
7-2183
WINTHER AAGE
7-2192
WISCONSIN UNIV
7-1913
WITTELS M
7-2180

WOOD J SUMNER JR
7-1864
WOOD R G
7-2036
WORMAN F C V
7-1869
WRIGHT G T
7-2037
WYLY L D
7-2150

YAMAGUCHI YOSHIO
7-2102
YATES PAUL C
7-1912
YOKOYAMA HISAKO O
7-1858 7-1860 7-1859
YOUNG C T
7-1991

ZEID MAHMOUD M I
7-1904

ZIMMER E L
7-2086
ZOLINGER J J VAN
7-2069
ZUCKER A
7-2150
ZUCKER E R
7-2190

NUMERICAL INDEX OF REPORTS

Numerical Index of Official Atomic Energy Reports with Indications of Their Availability

This list in the individual issues of Volume 7 supplements the Numerical Index of Reports with Indications of Their Availability which appears in NSA, Volume 6, No. 24A. As reports are in manuscript form when abstracted for NSA, there may be some delay before the reports will be available at the Depository Libraries. The notation NSA in the Availability column indicates the appearance of a report in its entirety in NSA. In general, this list refers only to those reports abstracted in issues preceding the current one. Orders for items for which prices are indicated should be directed to:

Office of Technical Services
Department of Commerce
Washington 25, D. C.

Abbreviations used below are:

NSA - NUCLEAR SCIENCE ABSTRACTS
ADD - ABSTRACTS OF DECLASSIFIED DOCUMENTS the predecessor of NSA
NNES - National Nuclear Energy Series, published by the McGraw-Hill Book Company

Code designations are assigned as follows:

MDDC - To declassified reports released by the Manhattan Engineer District and by the Atomic Energy Commission before March 1, 1948
AECD - To declassified reports released by the Atomic Energy Commission after February 29, 1948 (appeared in April 15, Nuclear Science Abstracts)
AECU - To unclassified reports originating within the Atomic Energy Project. (Subsequent to AECU-671, this code is applied only to reports carrying no other recognized code designation.)

Other code designations below are assigned to unclassified reports by the originating installations

Report	Abstract	Availability
AECD-1780	ADD 2,p.228	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
1801	2,p.236	NNES Div. VI, Vol. 1, Pt. III, Chap. 18
1915	2,p.285	NNES Div. VI, Vol. 1, Pt. IV, Chap. 24
1916	2,p.286	NNES Div. VI, Vol. 1, Pt. IV, Chap. 24
1917	2,p.286	NNES Div. VI, Vol. 1, Pt. IV, Chap. 24
1918	2,p.287	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
1919	2,p.287	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
1920	2,p.287	NNES Div. VI, Vol. 1, Pt. IV, Chap. 23
1963	2,p.307	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
1964	2,p.307	NNES Div. VI, Vol. 1, Pt. IV, Chap. 25
1967	2,p.310	NNES Div. VI, Vol. 1, Pt. IV, Chap. 24
1968	2,p.311	NNES Div. VI, Vol. 1, Pt. IV, Chap. 25
1981	2,p.316	NNES Div. VI, Vol. 1, Pt. IV, Chap. 25
2008	2,p.335	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
2018	2,p.344	NNES Div. VI, Vol. 1, Pt. IV, Chap. 24
2019	2,p.344	NNES Div. VI, Vol. 1, Pt. IV, Chap. 24
2028	NSA 1-41	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
2127	1-611	NNES Div. VI, Vol. 1, Pt. III, Chap. 22
2129	1-612	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
2150	1-749	NNES Div. VI, Vol. 1, Pt. IV, Chap. 23
2161	1-753	NNES Div. VI, Vol. 1, Pt. III, Chap. 19
2212	1-907	NNES Div. VI, Vol. 1, Pt. IV, Chap. 23
AECD-2215	NSA 1-908	NNES Div. VI, Vol. 1, Pt. IV, Chap. 24
2216	1-1074	NNES Div. VI, Vol. 1, Pt. III, Chap. 18
2244	1-223	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
2267	1-1226	NNES Div. VI, Vol. 1, Pt. III, Chap. 19
2442	2-898	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
2580	2-2080	NNES Div. VI, Vol. 1, Pt. IV, Chap. 18
2769	4-1906	NNES Div. VI, Vol. 1, Pt. III, Chap. 18
2770	4-1908	NNES Div. VI, Vol. 1, Pt. III, Chap. 20
2771	4-1909	NNES Div. VI, Vol. 1, Pt. III, Chap. 20
2772	4-1910	NNES Div. VI, Vol. 1, Pt. III, Chap. 20
2773	4-1911	NNES Div. VI, Vol. 1, Pt. III, Chap. 20
2774	4-1912	NNES Div. VI, Vol. 1, Pt. III, Chap. 20
2775	4-1913	NNES Div. VI, Vol. 1, Pt. III, Chap. 20
2776	4-1914	NNES Div. VI, Vol. 1, Pt. III, Chap. 20
2777	4-1915	NNES Div. VI, Vol. 1, Pt. III, Chap. 20
2778	4-1916	NNES Div. VI, Vol. 1, Pt. III, Chap. 20
2779	4-1917	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
2780	4-1918	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
2783	4-1924	NNES Div. VI, Vol. 1, Pt. IV, Chap. 25
2784	4-1925	NNES Div. VI, Vol. 1, Pt. IV, Chap. 26
2785	4-1926	NNES Div. VI, Vol. 1, Pt. IV, Chap. 26
2786	4-1927	NNES Div. VI, Vol. 1, Pt. IV, Chap. 26

Report	Abstract	Availability
AECD-2787	NSA 4-1928	NNES Div. VI, Vol. 1, Pt. IV, Chap. 27
2788	4-1929	NNES Div. VI, Vol. 1, Pt. IV, Chap. 28
2789	4-1930	NNES Div. VI, Vol. 1, Pt. IV, Chap. 29
3269	6-353	Am. J. Phys. 20, 536-58(1952)
3343	6-2619	Anal. Chem. 25, 226-30(1953)
3453	7-219	J. Soc. Motion Picture Television Engrs. 59, 503-11(1952)
3484	7-1272	$0.20
AECU-95	2-1150	NNES Div. VI, Vol. 1, Pt. IV, Chap. 24
132	2-1455	NNES Div. VI, Vol. 1, Pt. IV, Chap. 24
148	2-1337	NNES Div. VI, Vol. 1, Pt. III, Chap. 19
667	4-1907	NNES Div. VI, Vol. 1, Pt. III, Chap. 19
668	4-1919	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
669	4-1920	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
670	4-1352	NNES Div. VI, Vol. 1, Pt. III, Chap. 21
2079	6-4437	Biochim. et Biophys. Acta 9, 597-600(1952)
2092	6-4552	J. Chem. Phys. 20, 1665-9 (1952)
2103	6-4730	Anal. Chem. 25, 350-1(1953)
2138	6-5037	J. Biol. Chem. 200, 407-16 (1953)
2145	6-5284	Am. J. Botany 39, 679-84(1952)
2151	6-5282	Laboratory Invest. 2, 1-14(1953)
2167	6-5533	Arch. Biochem. and Biophys. 42, 72-82(1953)
2168	6-5570	Anal. Chem. 24, 2000(1952)
2170	6-5546	Evolution 6, 333-41(1952)
2179	6-5534	Stain Technol. 28, 19-26(1953)
2183	6-5557	J. Nutrition 49, 183-90(1953)
2189	6-5535	Arch. Biochem. and Biophys. 42, 25-40(1953)
2199	6-5576	Phys. Rev. 89, 870-5(1953)
2207	6-5926	Cancer Research 12, 912-14 (1952)
2208	6-5927	Cancer Research 12, 915-17 (1952)
2231	6-6407	Nucleonics 11, No. 1, 70(1953)
2239(add.)	7-1449	Phys. Rev. 89, 654(1953)
2253	6-6527	J. Am. Chem. Soc. 74, 6152 (1952)
2257	6-6709	Phys. Rev. 89, 672-8(1953)
2284	7-385	Phys. Rev. 89, 854-5(1953)
2291	7-658	Phys. Rev. 89, 760-5(1953)
2296	7-669	Phys. Rev. 89, 824-6(1953)
2346	7-1829	NSA
2365	7-1780	Phys. Rev. 89, 665(1953)
AECU-2387	NSA 7-1577	Proc. Soc. Expti. Biol. Med. 81, 125-8(1952)
AERE C/M-129	6-2770	1s.0d.
AERE C/M-152	7-100	2s.6d.
AERE C/M-154	7-520	1s.0d.
AERE C/R-552	5-2221	1s.9d.
AERE C/R-801	6-2860	7s.0d.
AERE C/R-861	6-5114	7s.6d.
AERE C/R-958	6-6510	12s.6d.
AERE E/R-817	6-2654	2s.6d.
AERE G/M-96	6-2367	J. Sci. Instruments 29, 336-7 (1952)
AERE I/M-16	6-2890	1s.9d.
AERE I/M-18	7-517	1s.0d.
AERE Inf. Bib.-76	6-1529	5s.0d.
AERE Inf. Bib.-80	6-1423	1s.0d.
AERE Inf. Bib.-83	7-212	1s.3d.
AERE R/L-5	7-666	5s.0d.
AERE R/R-922	7-667	Nucleonics 11, No. 2, 50-60 (1952); 6s.0d.
AERE R/R-961	7-1506	2s.0d.
AERE R/R-1019	7-1473	1s.9d.
AERE T/M-68	7-1517	2s.0d.
AERE T/R-802	6-1003	2s.6d.
AERE T/R-1006	7-1463	2s.6d.
AERE T/R-1008	7-1494	2s.6d.
ARL-RI/R-251	5-2510	J. Sci. Instruments 29, 189-92 (1952)
BMI-773	7-1111	$0.10
BNL-1137	6-2804	Agron. J. 44, 610-14(1952)
1280	7-599	Phys. Rev. 89, 826-31(1953)
HW-25258	7-235	$0.10
ISC-260	6-5991	Anal. Chem. 25, 249-52(1953)
M-1980	1-906	NNES Div. VI, Vol. 1, Pt. IV, Chap. 25
MDDC-1731	ADD 2,p.169	NNES Div. VI, Vol. 1, Pt. III, Chap. 20
NM-006-012.04.54	7-493	Am. J. Physiol. 170, 418-25 (1952)
NP-3596	6-2117	Acta Cryst. 5, 811-17(1952)
4202	7-1286	J. Chem. Phys. 20, 1979(1953)
NYO-769	6-6363	J. Applied Phys. 24, 52(1953)
3225	6-6134	Phys. Rev. 89, 786-74(1953)
3901(p.26-36)	7-390	Phys. Rev. 89, 679-83(1953)
4026	6-6524	New Engl. J. Med. 247, 877-88 (1952)
RCC/R-26	7-245	4s.0d.
SO-3501	7-539	$0.55
UCLA-237	7-714	$0.20
UCRL-1913(rev.)	7-350	Phys. Rev. 89, 603-5(1953)
1960	7-351	Phys. Rev. 89, 790-2(1953)
1991	7-681	Phys. Rev. 89, 758-9(1953)

NEW NUCLEAR DATA

Summary of New Nuclear Data on Half Lives, Radiations, Relative Isotopic Abundances, Nuclear Moments, Neutron Cross Sections, Reaction Energies, and Masses.

Prepared by National Bureau of Standards Nuclear Data Group with the Assistance of Readers.

For a list of the abbreviations used in this section, see NSA, Vol. 7, No. 1, page "SUPPLEMENT 1".

$_{3}Li^{7}_{4}$

Level $Li^{6}(d,p)$ $Be^{9}(d,\alpha)$ s
0.477

E.R.Collins, C.D.McKenzie, C.A.Ramm, Proc. Roy. Soc. 216A, 242(1953).

Levels $Be^{9}(d,\alpha)$ s

Level	$E_d = 0.47$	$E_d = 1.0$
g.s.	100^{+}	100^{+}
(0.48)	100^{+}	70^{+}
4.62	20^{+}	100^{+}

H^3 continuum observed from 4.62 level
$^{+}$Relative yields at 90°

R.W.Gellnas, S.S.Hanna, Phys. Rev. 89, 483(1953).

$_{3}Li^{9}_{6}$

β^- and 2 α's found in μ meson star
$E_{\beta^-} \sim 8$, E_α(total) = 4.4 indicate decay of Li^9 via 6.8 level of Be^9

W.F.Fry, Phys. Rev. 89, 325(1953).

$_{4}Be^{8}_{4}$

Resonance $Li^{7}(p,\gamma)$ $\Gamma = 12.2$ kev EA
0.4415

S.E.Hunt, Proc. Phys. Soc. 65A, 982(1952).

Levels $Be^{9}(d,t)$ $E_d = 1.0$ s

3.5^{+}	g.s.
15^{+}	(2.9)

$^{+}$Relative yields at 90°

R.W.Gellnas, S.S.Hanna, Phys. Rev. 89, 483(1953).

$_{5}B^{10}_{5}$

μ **1.80114*** **1.80082**** I

*$\nu(B^{10})/\nu(D) = 0.700065 \pm 0.00007$
**$\nu(B^{10})/\nu(Rb^{85}) = 1.11282 \pm 0.00005$
$Na_2B_2O_4$, D_2O, RbCl

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

$_{6}C^{12}_{6}$

Level $N^{15}(p,\alpha\gamma)$ $E_p = 0.429$, s
$p,\gamma(\theta)$; $p,\alpha(\theta)$ 0.890, 1.210
(4.43) 2 +

A.A.Kraus, Jr., A.P.French, W.A.Fowler, C.C.Lauritsen, Phys. Rev. 89, 299(1953).

$_{7}N^{14}_{7}$

μ **0.40370** I
$\nu(N^{14})/\nu(Rb^{85}) = 0.74837 \pm 0.00004$
HNO_3, RbCl

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

$_{8}O^{16}_{8}$

Levels $N^{15}(p,\alpha\gamma)C^{12}$ s

$p,\gamma(\theta)$	(12.51)	2 −
$p,\alpha(\theta)$	(12.96)	2 −
	(13.24)	4 +

A.A.Kraus, Jr., A.P.French, W.A.Fowler, C.C.Lauritsen, Phys. Rev. 89, 299(1953).

$_{9}F^{20}_{11}$

Levels $F^{19}(d,p)$ $E_d = 3.6$ ic

$d,p(\theta)$	g.s.	$l_n = 0$ and 2
	(0.65)	$l_n = 2$
	(~2.05)	$l_n = 2$
	(~3.49)	$l_n = 0$

D.A.Bromley, J.A.Bruner, H.W.Fulbright, Phys. Rev. 89, 396(1953).

$_{10}Ne^{20}_{10}$

Resonances $F^{19}(p,\alpha\gamma)$ EA
0.3404 $\Gamma = 2.9$ kev
0.4831 $\Gamma = 2.2$ kev

S.E.Hunt, Proc. Phys. Soc. 65A, 982(1952).

Level $F^{19}(p,\gamma)$ $E_p = 0.70$ scin
(>7.5γ) (γ) **1.66**

G.A.Jones, D.H.Wilkinson, Proc. Phys. Soc. 65A, 1055(1952).

Na

Neutron resonance (ev) $E_n = 1$ ev to 10 kev
~3500 $\sigma_o \Gamma_n^2 = 58 \times 10^6$

E.R.Hodgson, J.F.Gallagher, E.M.Bowey, Proc. Phys. Soc. 65A, 992(1953).

$_{12}Mg^{28}_{16}$

τ **21.3^h** p 2.3^{m}Al Mg(30-Mev α)
Si(≤100-Mev γ) chem

R.K.Sheline, N.R.Johnson, Phys. Rev. 89, 520(1953).

Si^{29} (14, 15)

Levels $Si^{28}(d,p)Si^{29}$ $E_d = 8$ pc

d,p(θ)

Level	l_{n-}
g.s.	0
(1.28)	2
(2.03)	2
(3.07)	2
(3.62)	3
(4.93)	1
(6.38)	1

J.R.Holt, T.N.Marsham, Phys. Rev. 89, 665(1953).

S^{33} (16, 17)

Levels $S^{32}(d,p)S^{33}$ $E_d = 8$ pc

d,p(θ)

Level	l_{n-}
g.s.	2
(0.85)	0
(2.90)	3
(3.26)	1
(4.21)	1
(4.89)	1
(5.72)	1

J.R.Holt, T.N.Marsham, Phys. Rev. 89, 665(1953).

Cl^{35} (17, 18)

μ 0.82111 I

$\nu(Cl^{35})/\nu(Rb^{85}) = 1.01481 \pm 0.00005$

$\mu(Cl^{35})/\mu(Cl^{37}) = 1.20128 \pm 0.00006$

LiCl, RbCl

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

Cl^{37} (17, 20)

μ 0.68352 I

$\nu(Cl^{37})/\nu(Rb^{85}) = 0.84477 \pm 0.00005$

LiCl, RbCl

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

Ca^{45} (20, 25)

τ 164^d Ca(pile n)

C.F.G.Delaney, J.H.J.Poole, Phys. Rev. 89, 529 (1953).

Sc^{46} (21, 25)

Capture γ's $Sc^{45}(n,\gamma)$ pair s

2^+	6.35	5^+	8.18
2.5^+	6.84	1^+	8.31
0.7^+	7.15	2.5^+	8.54
1^+	7.65	0.3^+	8.85

[+]Photons per 100 n captures

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

Ti

Capture γ Ti(n,γ) pair s

1.4^+	4.67

Isotopic assignment uncertain

[+]Photons per 100 n captures

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Ti^{48} (22, 26)

Capture γ's Ti(n,γ) pair s

1.5^+	7.38 ?
0.4^+	8.27 ?
0.1^+	9.39 ?

Assignment assuming n binding = 11.63, 9.39γ to 2.31β decay level

[+]Photons per 100 n captures in Ti

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Ti^{49} (22, 27)

Capture γ's Ti(n,γ) pair s

5^+	4.88
3.5^+	4.96
0.4^+	5.65 ?
32^+	6.412
4^+	6.53
53^+	6.756

Assignment from agreement with d,p results

[+]Photons per 100 n captures in Ti

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Ti^{50} (22, 28)

Capture γ's Ti(n,γ) pair s

53^+	6.756 ? (also Ti^{49})
0.8^+	7.80 ?
0.2^+	9.19 ?

Assignment assuming n binding = 10.8, 9.19γ to 1.58 d,p level

[+]Photons per 100 n captures in Ti

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

V^{51} ? (23, 28)

Capture γ's V(n,γ) pair s

0.3^+	7.67
1.3^+	7.83
0.5^+	7.98

E_γ greater than V^{51} n binding

γ intensity implies $\sigma_a(V^{50}) = 40 - 400$

[+]Photons per 100 n captures in V

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

V^{52} (23, 29)

Capture γ's V(n,γ) pair s

2^+	3.39	10^+	5.511
3^+	3.59	9^+	5.744
3^+	3.73	3^+	5.88
4^+	4.15	25^+	6.508
3^+	4.45	0.7^+	6.62
2^+	4.85	14^+	6.868
2^+	4.98	18.5^+	7.154
6^+	5.21	11^+	7.305

[+]Photons per 100 n captures in V

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

Cr

Capture γ's Cr(n,γ) pair s

0.5^+	3.72	3.0^+	6.644
0.6^+	4.83	0.6^+	6.872
1^+	5.26	2.6^+	7.097
2^+	5.61	0.2^+	7.21
1^+	6.00	0.2^+	7.54
0.7^+	6.12	0.2^+	7.67
0.9^+	6.26	7^+	8.499
0.3^+	6.358		

Isotopic assignment uncertain

[+]Photons per 100 n captures

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

$Cr^{53}_{24\ 29}$

Levels $Cr^{52}(d,p)$ $E_d = 10.2$ ppl

0.54	3.20
0.97	3.65
1.29	4.10
2.66	

C.E.McFarland, W.W.Bretscher, F.B.Shull, Phys. Rev. 89, 892A(1953).

Capture γ's	$Cr(n,\gamma)$	pair s
$3^{\dagger}$	7.364	
$8^{\dagger}$	7.929	

Assignment from agreement with d,p results
†Photons per 100 n captures in Cr

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

$Cr^{54}_{24\ 30}$

Capture γ's	$Cr(n,\gamma)$	pair s
$19^{\dagger}$	8.881	
$7^{\dagger}$	9.716	

Assignment from masses and Mn^{54} 0.835γ
†Photons per 100 n captures in Cr

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

$Mn^{56}_{25\ 31}$

Capture γ's	$Mn^{55}(n,\gamma)$		pair s
$1^{\dagger}$	3.82	$0.3^{\dagger}$	5.63
$1^{\dagger}$	4.10	$1^{\dagger}$	5.77
$2^{\dagger}$	4.24	$0.5^{\dagger}$	5.91
$2^{\dagger}$	4.55	$1^{\dagger}$	6.11
$2^{\dagger}$	4.72	$0.6^{\dagger}$	6.43
$2^{\dagger}$	4.81	$2.5^{\dagger}$	6.779
$6^{\dagger}$	5.04	$6.5^{\dagger}$	7.048
$3^{\dagger}$	5.21	$4^{\dagger}$	7.15
$4^{\dagger}$	5.53	$12^{\dagger}$	7.261

†Photons per 100 n captures

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

Fe

Capture γ's	$Fe(n,\gamma)$	pair s
$2.0^{\dagger}$	3.43	
$0.5^{\dagger}$	3.86	
$2^{\dagger}$	4.21	
$1^{\dagger}$	4.44	
$1^{\dagger}$	4.81	
$0.4^{\dagger}$	6.369	

Isotopic assignment uncertain
†Photons per 100 n captures

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

$Fe^{55}_{26\ 29}$

Capture γ's	$Fe(n,\gamma)$	pair s
$0.8^{\dagger}$	8.345	
$0.5^{\dagger}$	8.872	
$2.7^{\dagger}$	9.298 (also Fe^{58} ?)	

Assignment from agreement with d,p and p,n results
†Photons per 100 n captures in Fe

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

$Fe^{57}_{26\ 31}$

Capture γ's	$Fe(n,\gamma)$	pair s
$0.5^{\dagger}$	4.968	
$5.2^{\dagger}$	5.914	
$5.6^{\dagger}$	6.015	
$3.5^{\dagger}$	7.285	
$36^{\dagger}$	7.639	

Assignment from agreement with d,p results
†Photons per 100 n captures in Fe

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

$Fe^{58}_{26\ 32}$

Capture γ's	$Fe(n,\gamma)$	pair s
$2.7^{\dagger}$	9.298 (also Fe^{55} ?)	
$0.1^{\dagger}$	10.16	

Assignment from masses and Co^{58} decay
†Photons per 100 n captures in Fe

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

$Fe^{59}_{26\ 33}$

γ	$58^{\dagger}$	1.10	sπ cpt
	$42^{\dagger}$	1.28	

No other γ (0.5 to 2.1) < 10%

B.S.Dzhelepov, N.N.Zhukovskii, Y.V.Khol'nov, Doklady Akad. Nauk SSSR 86, 497(1952).

$Co^{58}_{27\ 31}$

τ	72^{d}	d 9.2^{h}Co chem

72^{d}

D.C.Hoffman, D.S.Martin Jr., J. Phys. Chem. 56, 1097(1952).

$Co^{60}_{27\ 33}$

Capture γ's	$Co^{59}(n,\gamma)$		pair s
$1^{\dagger}$	3.36	$5.6^{\dagger}$	5.966
$0.7^{\dagger}$	3.69	$0.5^{\dagger}$	6.11
$1^{\dagger}$	4.03	$0.7^{\dagger}$	6.250
$0.8^{\dagger}$	4.18	$5^{\dagger}$	6.474
$1^{\dagger}$	4.37	$8^{\dagger}$	6.690
$0.6^{\dagger}$	4.59	$7^{\dagger}$	6.867
$2.5^{\dagger}$	4.903	$2.5^{\dagger}$	6.97
$2^{\dagger}$	5.18	$1.3^{\dagger}$	7.04
$0.7^{\dagger}$	5.35	$4.0^{\dagger}$	7.201
$6.3^{\dagger}$	5.646	$3.0^{\dagger}$	7.486
$1.7^{\dagger}$	5.73		

†Photons per 100 n captures

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

Ni

Capture γ's	$Ni(n,\gamma)$		pair s
$3^{\dagger}$	5.82	$8^{\dagger}$	6.84
$0.3^{\dagger}$	5.99	$0.5^{\dagger}$	7.05
$1.0^{\dagger}$	6.10	$0.5^{\dagger}$	7.22
$0.6^{\dagger}$	6.34	$2.8^{\dagger}$	8.12
$2.0^{\dagger}$	6.58		

Isotopic assignment uncertain
†Photons per 100 n captures

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

$Ni^{59}_{28\ 31}$

Levels $Ni^{58}(d,p)$ $E_d = 10.2$ ppl

0.42	5.20
3.08	5.66
4.57	

C.E.McFarland, W.W.Bretscher, F.B.Shull, Phys. Rev. 89, 892A(1953).

$_{28}Ni^{59}_{31}$

Capture γ's	Ni(n,γ)	pair s
1^+	5.31	
0.4^+	5.70	
14^+	8.532 (also Ni^{61} ?)	
35^+	8.997	

Assignment from agreement with d,p results
+Photons per 100 n captures in Ni

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

$_{28}Ni^{61}_{33}$

Capture γ's	Ni(n,γ)	pair s
4^+	7.528	
6.5^+	7.817	
14^+	8.532 (also Ni^{59} ?)	

Assignment from agreement with d,p results and Cu^{61} decay
+Photons per 100 n captures in Ni

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

Cu

Capture γ's	Cu(n,γ)		pair s
0.7^+	5.07	0.2^+	5.75
0.6^+	5.18	1^+	6.05
1^+	5.31	1^+	6.41
1^+	5.43	1^+	7.16
0.5^+	5.64		

Isotopic assignment uncertain
+Photons per 100 n captures

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

$_{29}Cu^{64}_{35}$

Capture γ's	Cu(n,γ)	pair s
3^+	6.69	
2^+	7.01	
5.5^+	7.296	
20^+	7.914	

Assignment from agreement with d,p results
+Photons per 100 n captures in Cu

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

$_{29}Cu^{66}_{37}$

Capture γ	Cu(n,γ)	pair s
9^+	7.634 ?	

Assignment from agreement with unpublished d,p results, but disagrees with Zn^{66} (γ,n)
+Photons per 100 n captures in Cu

G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386 (1953).

Zn

Capture γ's	Zn(n,γ)		pair s
1.2^+	4.14	0.3^+	6.26
1.6^+	4.84	1^+	6.49
0.7^+	5.23	0.5^+	6.65
2.5^+	5.48	2.7^+	6.94
1^+	5.77	2.0^+	7.19
0.8^+	6.03		

Isotopic assignment uncertain
+Photons per 100 n captures

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

$_{30}Zn^{65}_{35}$

Capture γ	Zn(n,γ)	pair s
10^+	7.876	

Assignment from agreement with d,p results
+Photons per 100 n captures in Zn

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953).

$_{30}Zn^{68}_{38}$

Capture γ's	Zn(n,γ)	pair s
0.6^+	8.31	
0.2^+	8.58	
0.2^+	8.98	
1^+	9.12	
0.07^+	9.51	

Assigned here since E_γ > n binding in other Zn's
+Photons per 100 n captures in Zn

B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375 (1953)

$_{32}Ge^{78}_{46}$

τ 86^m U^{235}(pile n,f) chem; pc

N. Sugarman, Phys. Rev. 89, 570(1953).

$_{33}As^{75}_{42}$

μ 1.43524 I
$\nu(As^{75})/\nu(D) = 1.11569 \pm 0.00005$
Na_2HAsO_4, D_2O

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

$_{33}As^{77}_{44}$

τ 38.0^h U^{235}(pile n,f) chem; pc

N.Sugarman, Phys. Rev. 89, 570(1953).

$_{33}As^{78}_{45}$

τ 91.0^m d 86^mGe^{78} U^{235}(pile n,fβ⁻)
No ~40^m activity observed chem; pc

N.Sugarman, Phys. Rev. 89, 570(1953).

$_{35}Br^{87}_{52}$

n	2%	U(n,f)	chem
β^-	70%	2.6	aβγ
	30%	8.0	a
γ	80%	2 - 4	
	20^+	5.4	

A.F.Stehney, N.Sugarman, Phys. Rev. 89, 194(1953).

$_{37}Rb^{84}_{47}$ $^m_{23}$

τ_1	21^m	Rb(fast n)	ion chem
γ	25^+	0.239	scin
	10^+	0.463	
(0.23γ)(0.23γ) No (0.23γ)(0.46γ)			scin
No x rays observed			pc

R.S.Caird, A.C.G.Mitchell, Phys. Rev. 89, 573 (1953).

$_{38}Sr^{89}_{51}$

Levels	Sr(d,p)	E_d = 10.4	s
	1.07		
	2.07		
	2.54		

C.E.McFarland, F.B.Shull, Phys. Rev. 89, 489(1953).

Neutron Cross Sections

Reaction	σ Type	Value	Energy	Ref.
H(n)	σ_t	1.690	4.75	53h3
Be(n)	σ_t	6.04	1ev-5kev	52h5
N(n)	σ_t	graph	1.7-4	52j2
Na(n)	σ_t	2.98	1ev-1kev	52h5
Na(n)	σ_t	graph	1ev-10kev	52h5
Sc(n)	σ_a	23	th	53i1
Sc(n)	σ_a	23	th	52p3
Ge(n)	σ_t	graph	0.4-3.5	52j2
Se(n)	σ_t	graph	0.4-3.5	52j2

52h5 E.R.Hodgson, J.F.Gallagher, E.M.Bowey, Proc. Phys. Soc. 65A, 992(1952).

52j2 C.M.Johnson, H.B.Willard, J.K.Bair, J.D.Kington, ORNL-1365, 1(1952).

52p3 H.Pomerance, ORNL-1415, 15(1952). Based on σ_a(Au)=95.

53h3 E.M.Hafner, W.F.Hornyak, C.E.Falk, G.Snow, T.Coor, Phys. Rev. 89, 204(1953).

53i1 E.E.Lockett, E.Bowell, Phys. Rev. 89, 657(1953). Based on σ_a(B)=710.

Ground State Q's

Reaction	Standard	Value	Method	Ref.
$Li^6(p,\alpha)He^3$	absolute	+ 4.023 ± 0.003	s	53c1
$Li^6(d,\alpha)He^4$	absolute	+22.396 ± 0.012	s	53c1
$Li^6(d,p)Li^7$	absolute	+ 5.028 ± 0.003	s	53c1
$Li^7(p,\alpha)He^4$	absolute	+17.352 ± 0.009	s	53c1
$Be^9(p,\alpha)Li^6$	absolute	+ 2.126 ± 0.003	s	53c1
$Be^9(d,\alpha)Li^7$	absolute	+ 7.153 ± 0.004	s	53c1
$Be^9(p,d)Be^8$	absolute	+ 0.560 ± 0.003	s	53c1
$Be^9(d,t)Be^8$		+ 4.60 ± 0.03	ppl	53c2
$B^{11}(p,\alpha)Be^8$	absolute	+ 8.589 ± 0.005	s	53c1
$N^{15}(p,\alpha)C^{12}$	absolute	+ 4.962 ± 0.004	s	53c1
$Al^{27}(p,n)Si^{27}$	$F^{19}(p,\alpha\gamma)$	- 5.61 ± 0.01	thresh	53k1
$S^{32}(\alpha,p)Cl^{35}$		- 2.02 ± 0.11	ppl	52f2
$Cl^{35}(n,\alpha)P^{32}$		+ 1.07 ± 0.15	ic	52f2
$Sc^{45}(n,\gamma)Sc^{46}$	absolute	+ 8.85 ± 0.08	pair s	53b1
$Ti^{47}(n,\gamma)Ti^{48}$	absolute	+ 9.39 ± 2.31 ?	pair s	53k2
$Ti^{48}(n,\gamma)Ti^{49}$	absolute	+ 6.76 ± 1.35 ?	pair s	53k2
$Ti^{49}(n,\gamma)Ti^{50}$	absolute	+ 9.19 ± 1.58 ?	pair s	53k2
$V^{51}(n,\gamma)V^{52}$	absolute	+ 7.305 ± 0.007	pair s	53b1
$Cr^{52}(d,p)Cr^{53}$		+ 5.70	s	53m1
$Cr^{52}(n,\gamma)Cr^{53}$	absolute	+ 7.929 ± 0.008	s	53k2
$Cr^{53}(n,\gamma)Cr^{54}$	absolute	+ 9.716 ± 0.008	s	53k2
$Mn^{55}(n,\gamma)Mn^{56}$	absolute	+ 7.261 ± 0.006	pair s	53b1
$Fe^{54}(n,\gamma)Fe^{55}$	absolute	+ 9.298 ± 0.007	pair s	53k2
$Fe^{56}(n,\gamma)Fe^{57}$	absolute	+ 7.639 ± 0.004 (+0, 0.014, or 0.13)	pair s	53k2
$Fe^{57}(n,\gamma)Fe^{58}$	absolute	+10.16 ± 0.04	pair s	53k2
$Co^{59}(n,\gamma)Co^{60}$	absolute	+ 7.486 ± 0.009	pair s	53b1
$Ni^{58}(d,p)Ni^{59}$		+ 6.77	ppl	53m1
$Ni^{58}(n,\gamma)Ni^{59}$	absolute	+ 8.997 ± 0.005	pair s	53k2
$Ni^{60}(n,\gamma)Ni^{61}$	absolute	+ 8.532 ± 0.008	pair s	53k2
$Cu^{63}(n,\gamma)Cu^{64}$	absolute	+ 7.914 ± 0.004	pair s	53b1
$Cu^{65}(n,\gamma)Cu^{66}$	absolute	+ 7.634 ± 0.006? See Cu^{66}	pair s	53b1
$Zn^{65}(n,\gamma)Zn^{66}$	absolute	+ 7.876 ± 0.007	pair s	53k2
$Zn^{67}(n,\gamma)Zn^{68}$	absolute	+ 9.51 ± 0.05 ?	pair s	53k2
$Sr^{88}(d,p)Sr^{89}$		+ 4.33 ± 0.10	s	53m1

52c2 J.Catalá, F.Senent, S.Casanova, Anales real soc. espan fis. y quim. 48A, 323(1952).

52f2 A.Folkierski, Proc. Phys. Soc. 65A, 1006(1952).

53b1 G.A.Bartholomew, B.B.Kinsey, Phys. Rev. 89, 386(1953).

53c1 E.R.Collins, C.D.McKenzie, C.A.Ramm, Proc. Roy. Soc. 216A, 242(1953).

53k1 J.D.Kington, J.K.Bair, K.R.Carlson, H.B.Willard, Phys. Rev. 89, 530(1953).

53k2 B.B.Kinsey, G.A.Bartholomew, Phys. Rev. 89, 375(1953). Isotopic assignments from various arguments. See notes under product nuclei.

53m1 C.E.McFarland, F.B.Shull, Phys. Rev. 89, 489(1953).

Packing Fraction Differences, Δf, in Units 10^{-4} amu

Doublet	Δf	Ref.
$H_2 - D$	+ 7.746 ± 0.004	53o1
$He^4 - D_2$	-64.01 ± 0.02	53o1
$B^{10} - Ne^{20}$	+16.722 ± 0.008	53o1
$B^{10}{}_H - B^{11}$	+10.41 ± 0.01	53o1
$B^{10}{}_D - C^{12}$	+22.51 ± 0.02	53o1
$B^{10}{}_F{}^{19} - C^{13}{}_O{}^{16}$	+ 4.500 ± 0.005	53o1
$B^{10}{}_{HF}{}^{19} - B^{11}{}_F{}^{19}$	+ 3.817 ± 0.005	53o1
$B^{11} - Ne^{22}$	+12.382 ± 0.007	53o1
$B^{11}{}_H - C^{12}$	+14.262 ± 0.005	53o1
$B^{11}{}_F{}^{19} - Si^{30}$	+11.316 ± 0.007	53o1
$C^{12} - D_3$	+70.50 ± 0.02	53o1
$C^{12}{}_{H_4} - O^{16}$	+22.759 ± 0.005	53o1
$C^{12}_2{}_{H_4} - C^{12}{}_O{}^{16}$	+13.008 ± 0.003	53o1
$C^{12}C^{13}{}_H - C^{12}_2{}_{H_3}$	- 1.661 ± 0.004	53o1
$C^{13}{}_O{}^{16} - Si^{29}$	+ 7.517 ± 0.006	53o1

Doublet	Δf	Ref.
$C^{13}O^{16} - B^{10}F^{19}$	− 4.500 ± 0.005	5301
$N^{14} - C^{12}H_2$	− 8.989 ± 0.004	5301
$N^{14}_2 - C^{12}_2H_4$	− 8.986 ± 0.004	5301
$N^{14}_2 - C^{12}O^{16}$	+ 4.019 ± 0.003	5301
$N^{15} - C^{12}H_3$	−15.585 ± 0.004	5301
$H_2O^{18} - D_2O^{16}$	− 4.15 ± 0.01	5301
$B^{10}F^{19} - C^{13}O^{16}$	+ 4.500 ± 0.005	5301
$B^{11}F^{19} - Si^{30}$	+11.316 ± 0.007	5301
$Ne^{20} - B^{10}$	−16.722 ± 0.008	5301
$Ne^{20} - D_2O^{16}$	−15.355 ± 0.008	5301
$Ne^{22} - B^{11}$	−12.382 ± 0.007	5301
$Al^{27} - C^{12}_2H_3$	−15.561 ± 0.007	5301
$Si^{28} - C^{12}O^{16}$	− 6.435 ± 0.005	5301
$Si^{29} - C^{13}O^{16}$	− 7.517 ± 0.008	5301
$Si^{30} - B^{11}F^{19}$	−11.316 ± 0.007	5301
$P^{31}H - S^{32}$	+ 2.969 ± 0.003	5302
$P^{31}H_2 - S^{32}H$	+ 2.876 ± 0.004	5302
$P^{31}H - O^{16}_2$	− 2.577 ± 0.004	5302
$S^{32} - P^{31}H$	− 2.969 ± 0.003	5302
$S^{32}H - P^{31}H_2$	− 2.876 ± 0.004	5302
$S^{32} - O^{16}_2$	− 5.539 ± 0.003	5301
$S^{32}H_2 - S^{34}$	+ 5.837 ± 0.008	5301
$S^{32}O^{16} - C^{12}_4$	− 6.900 ± 0.005	5301
$S^{33}H_2 - S^{34}H$	+ 3.250 ± 0.009	5301
$S^{34}H_2 - C^{12}_3$	− 4.596 ± 0.008	5301
$HCl^{35} - C^{12}_3$	− 6.479 ± 0.003	5301
$Cl^{37} - C^{12}_3H$	−11.352 ± 0.004	5301
$HCl^{37} - C^{12}_3H_2$	−11.053 ± 0.004	5301
$A^{40} - D_2C^{16}$	−20.959 ± 0.007	5301
$A^{40} - C^{12}_3H_4$	−17.234 ± 0.007	5301

5301 K.Ogata, H.Matsuda, Phys. Rev. 89, 27(1953).
5302 K.Ogata, H.Matsuda, Phys. Rev. 89, 333(1953).